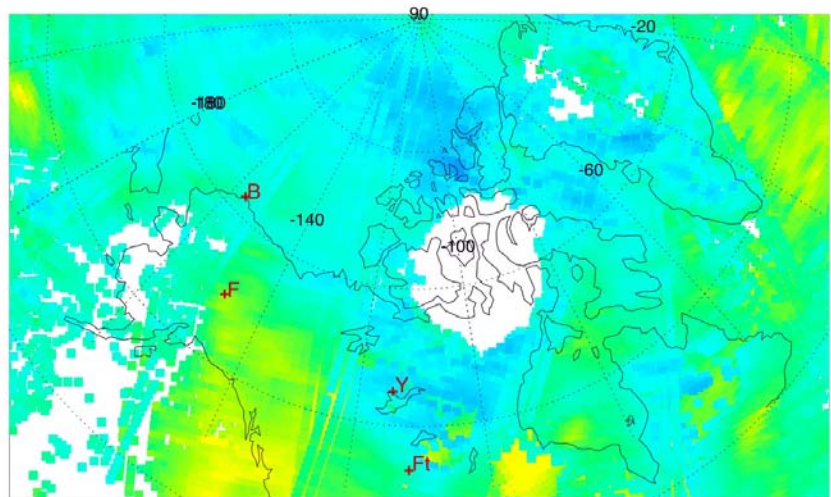


AIRS NRT ARCTAS Support: latest CO & CH₄

Juying Warner and Zigang Wei

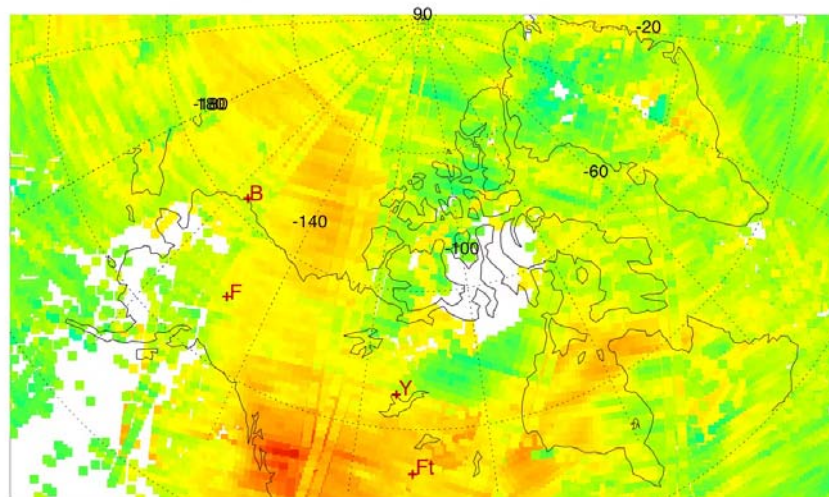
AIRS CO_VMR (ppbv) at 500mb on 20080330 for ARCTAS



0.0 27.8 55.6 83.3 111.1 138.9 166.7 194.4 222.2 251

CONTACT: Dr. Juying Warner <juying@umbc.edu>; ACKNOWLEDGEMENT: AIRS NRT products by NASA DA.

AIRS CH₄_VMR (ppbv) at 500mb on 20080330 for ARCTAS



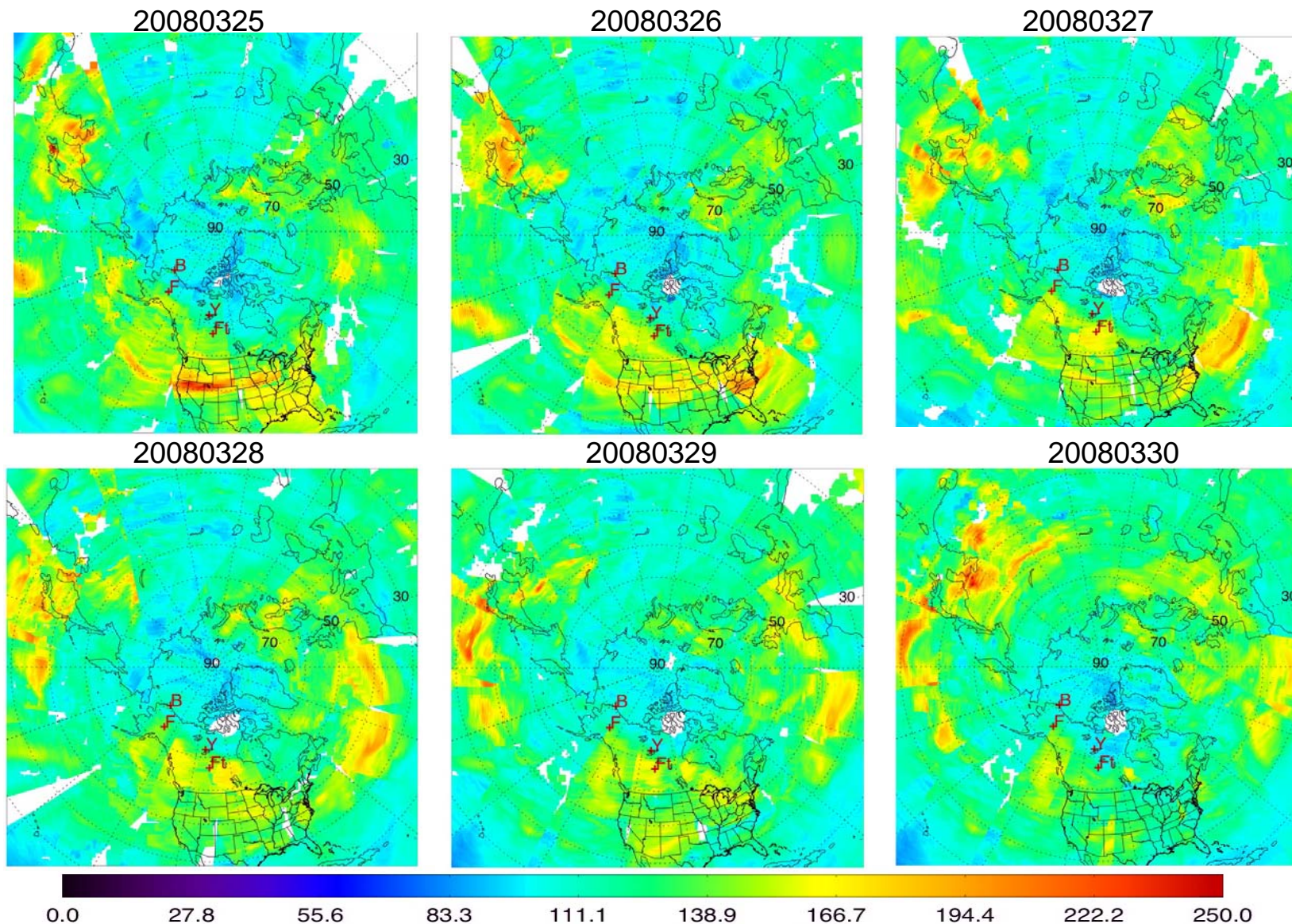
1500.0 1555.6 1611.1 1666.7 1722.2 1777.8 1833.3 1888.9 1944.4 200

CONTACT: Dr. Juying Warner <juying@umbc.edu>; ACKNOWLEDGEMENT: AIRS NRT products by NASA DA.

- AIRS CO at 500mb (ppbv) show similar patterns over the Arctic region for the last few days
- Local CO over Barrow and some transported CO at Ft. McMurray
- Higher CH₄ concentrations over the West coast of Canada.

AIRS NRT ARCTAS Support: CO Transport

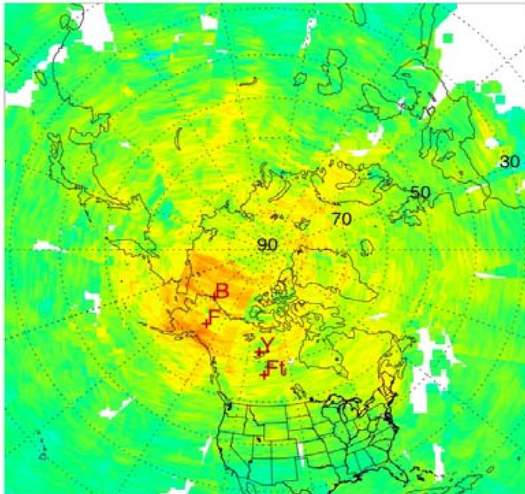
CO Transport affects Ft. McMurray not Barrow



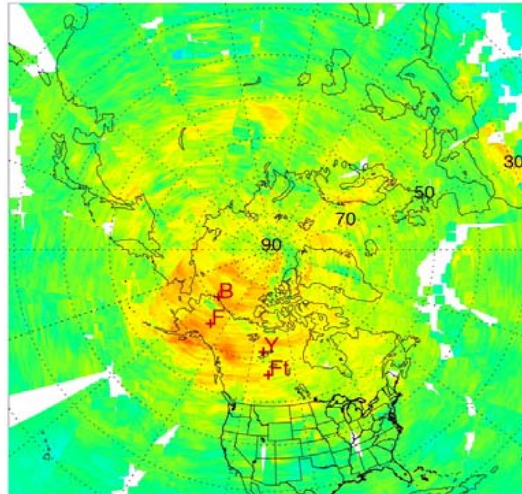
AIRS NRT ARCTAS Support: CH₄ Changes

Continued high concentrations over Alaska and West Coast of Canada

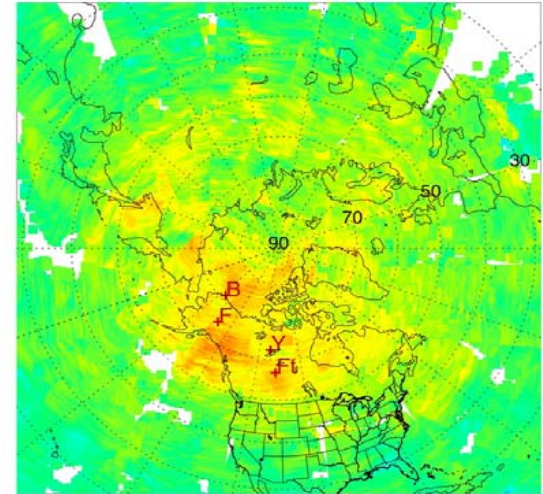
20080325



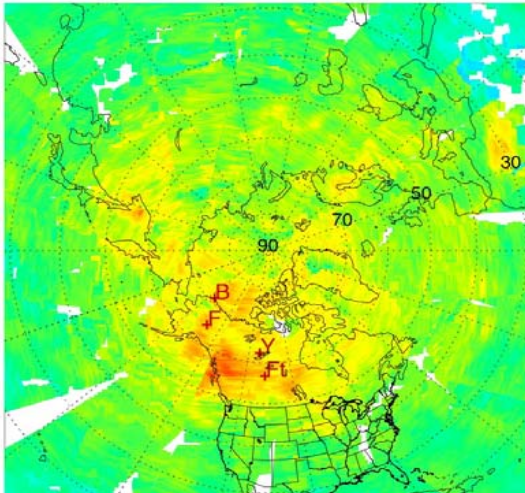
20080326



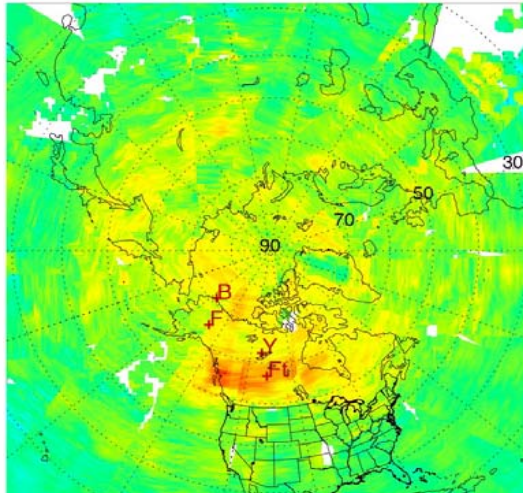
20080327



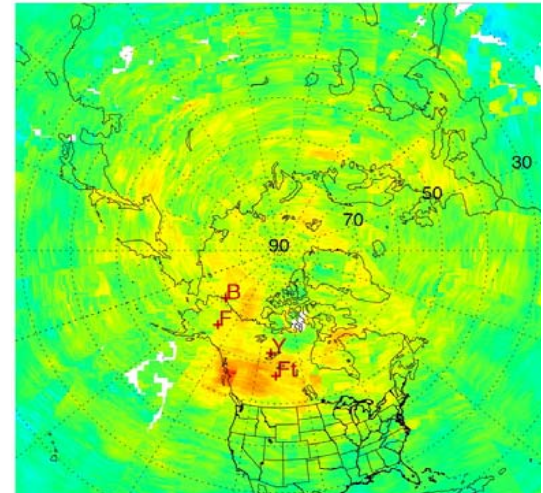
20080328



20080329

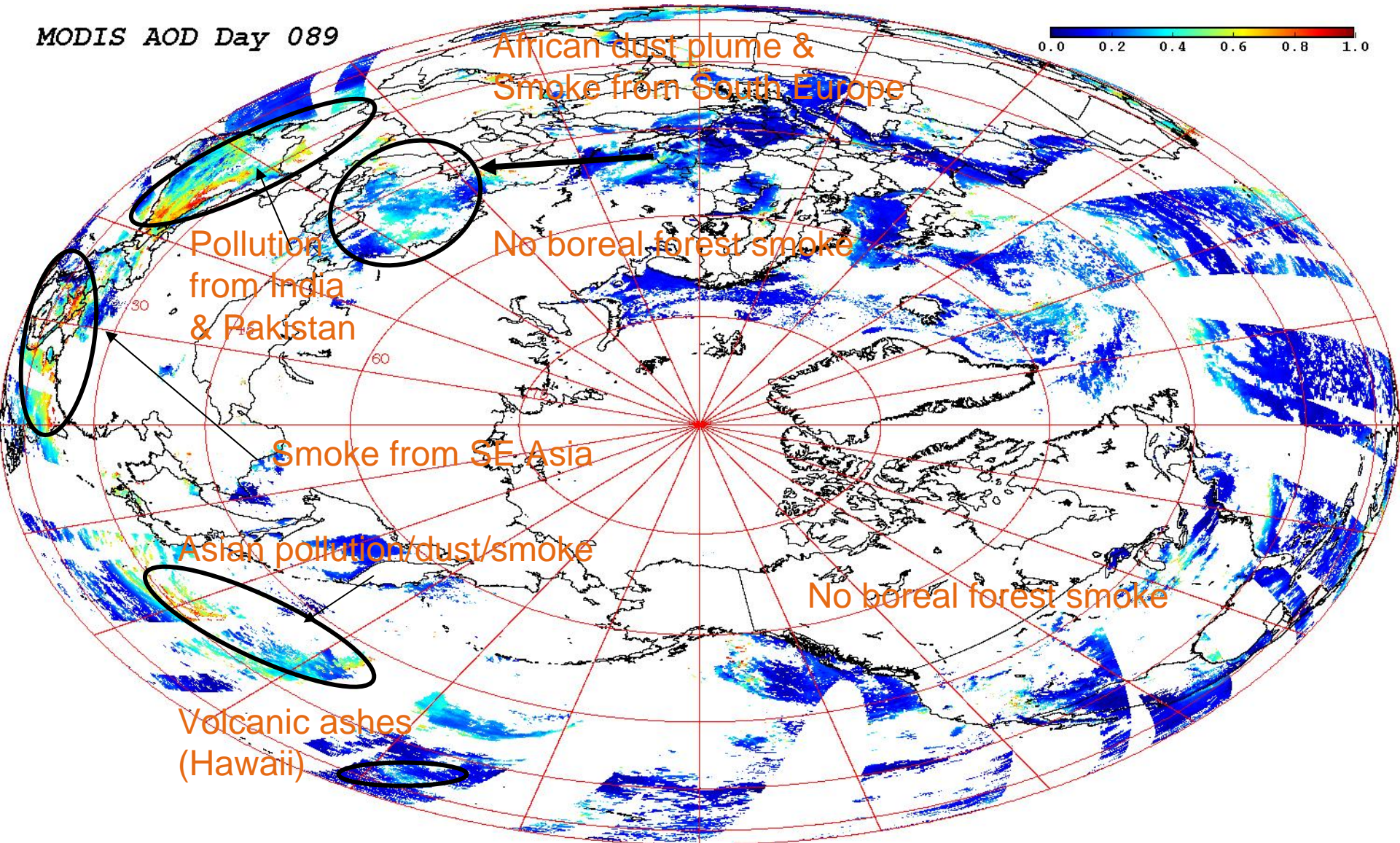


20080330

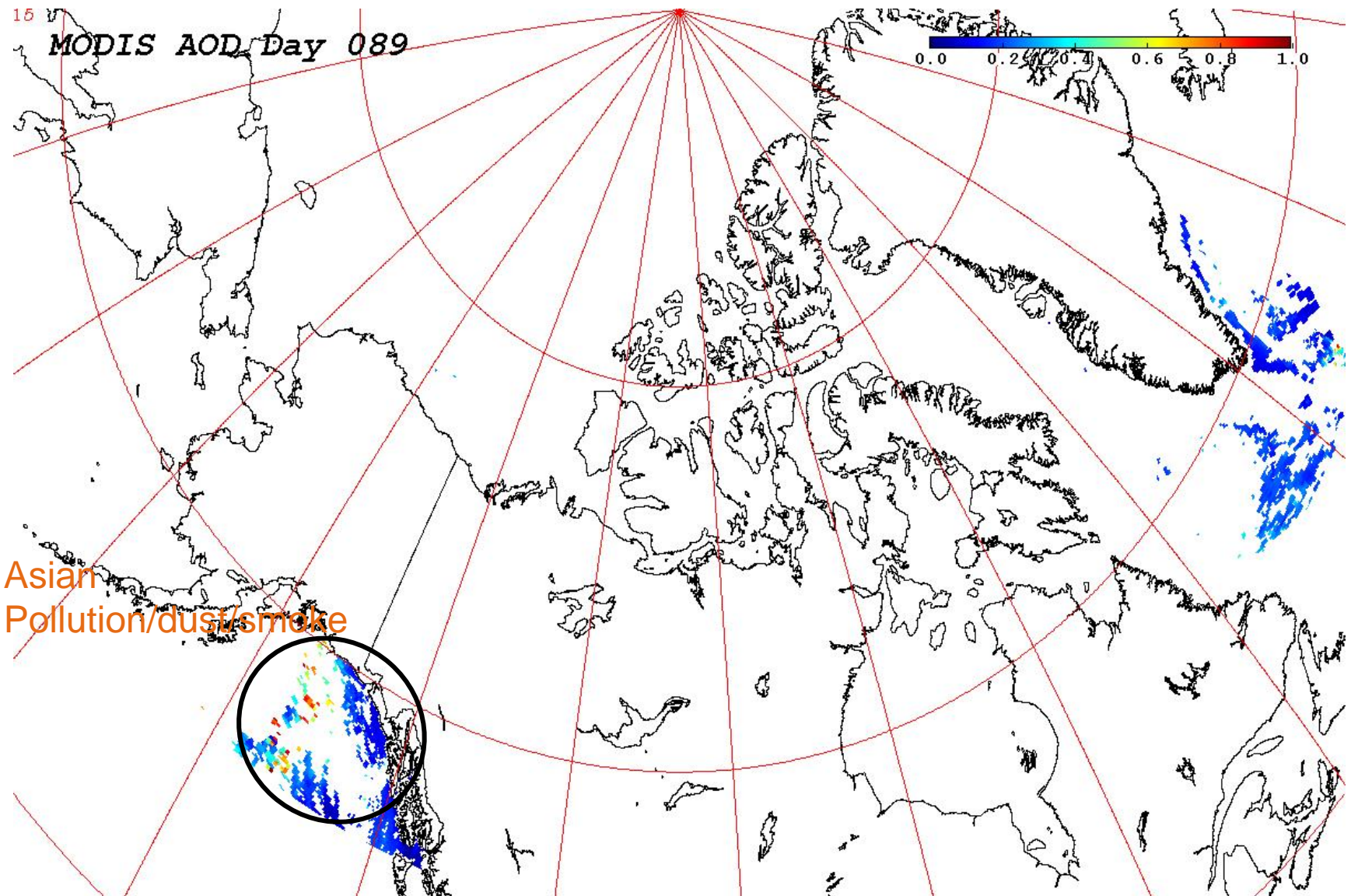


MODIS AOD Hot Spots in Northern Hemisphere (0° - 90°N)

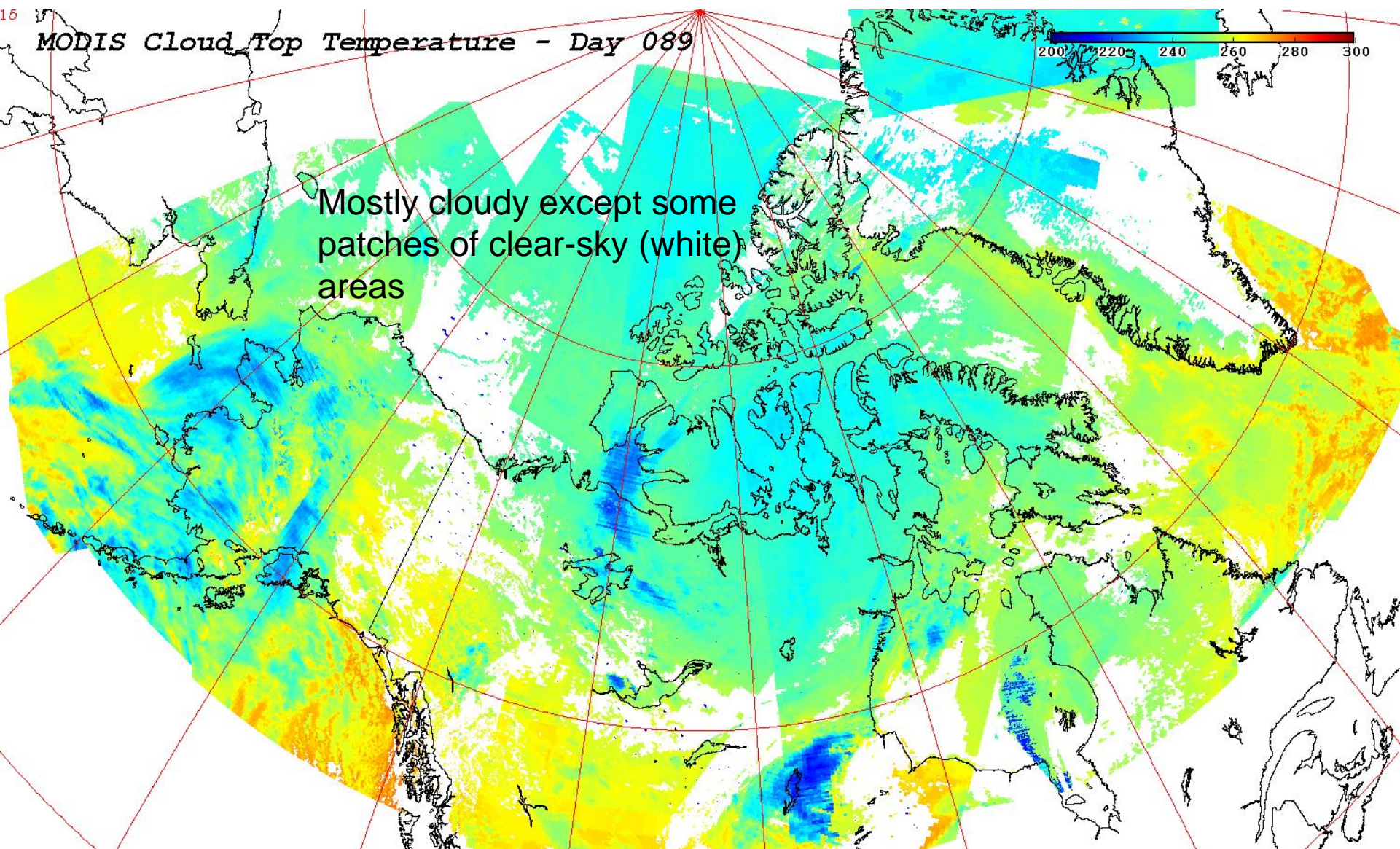
MODIS AOD Day 089



MODIS AOD Hot Spots in Flight Domain



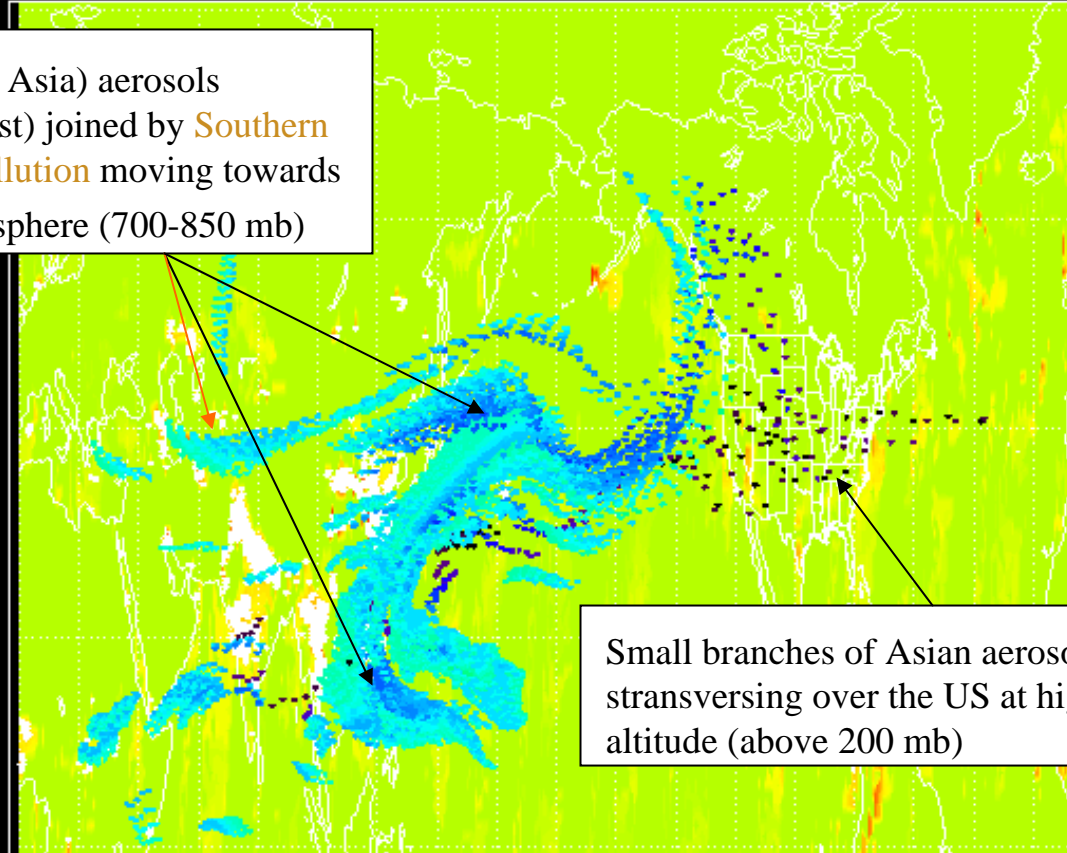
MODIS Cloud Top Temperature in Flight Domain



Aerosol Trajectory Based Upon MODIS AOD and GEOS-5 Winds

MODIS BL Trajectories initialized 2008032700 Valid 2008033118

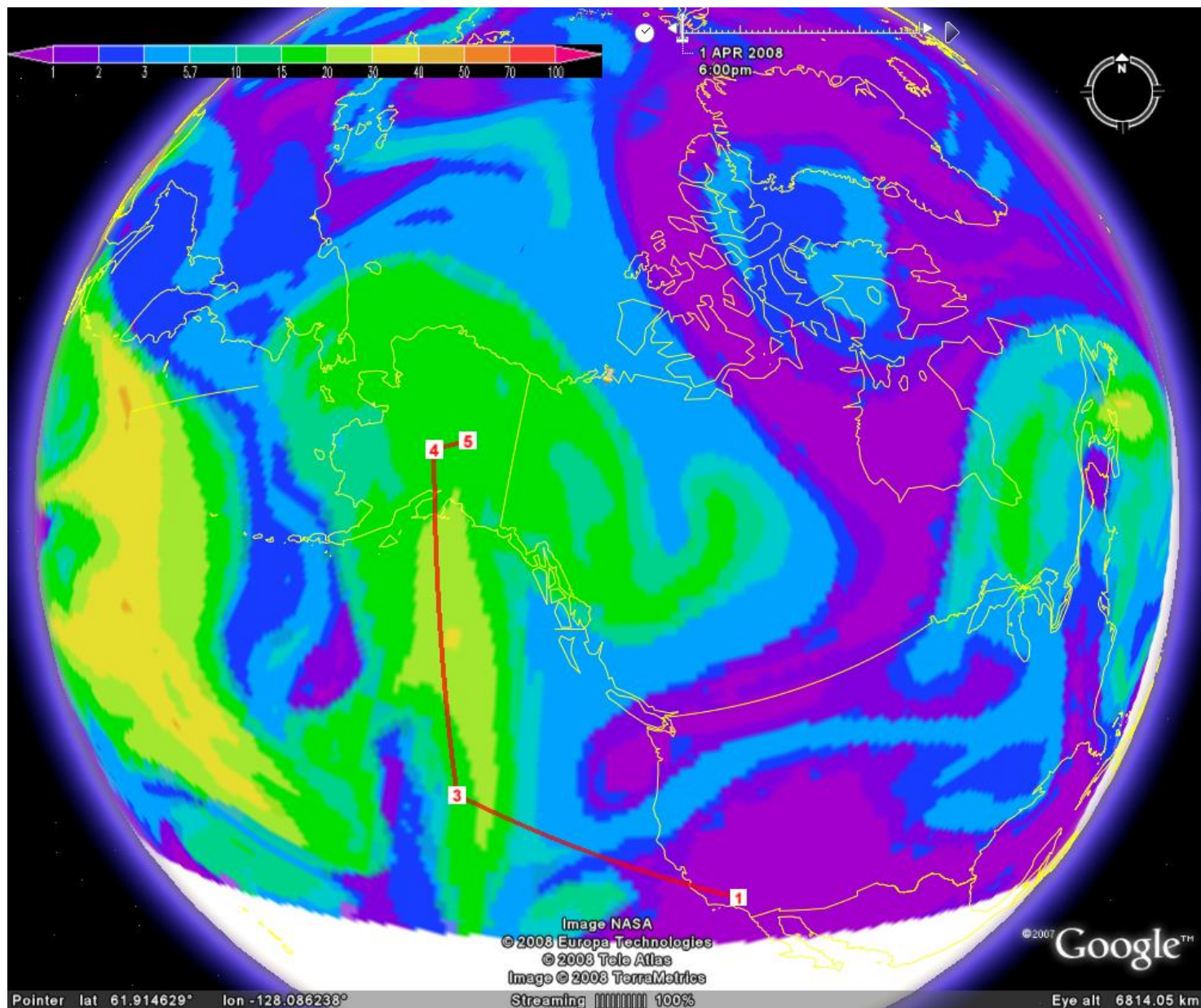
Asian (including SE Asia) aerosols
(pollution/smoke/dust) joined by **Southern
European smoke/pollution** moving towards
Alaska in mid-atmosphere (700-850 mb)



Small branches of Asian aerosols
stransversing over the US at high
altitude (above 200 mb)

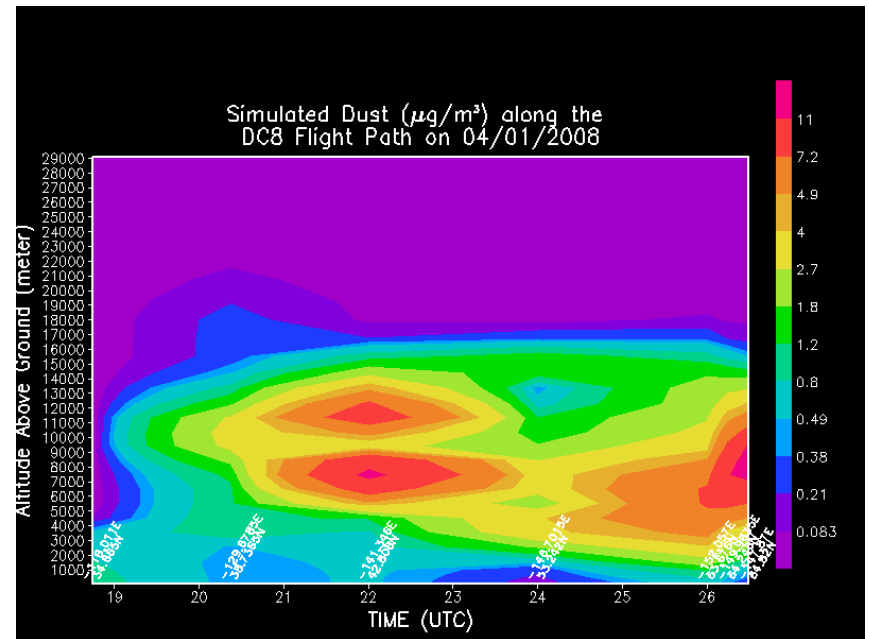
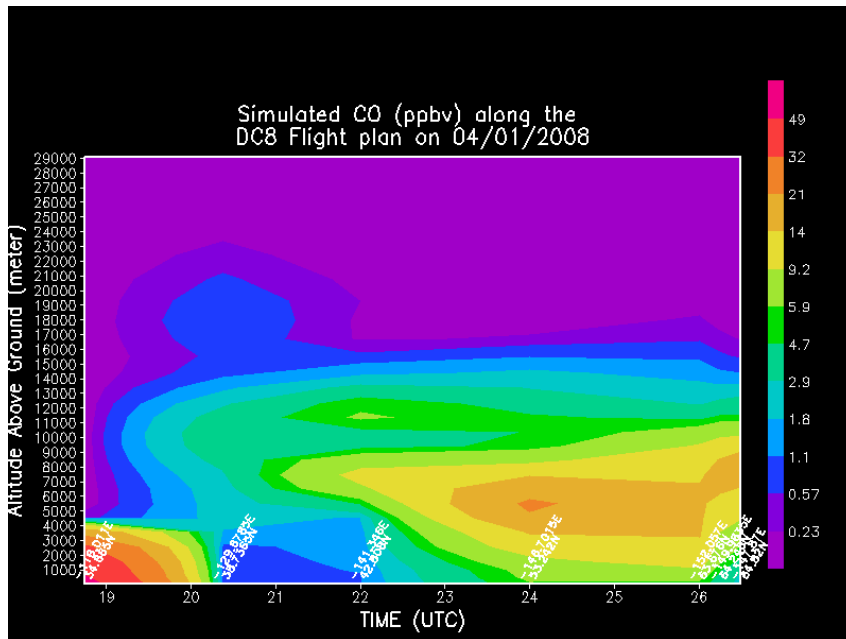
University of Iowa STEM Model

Flight planning meeting
03-30-2008



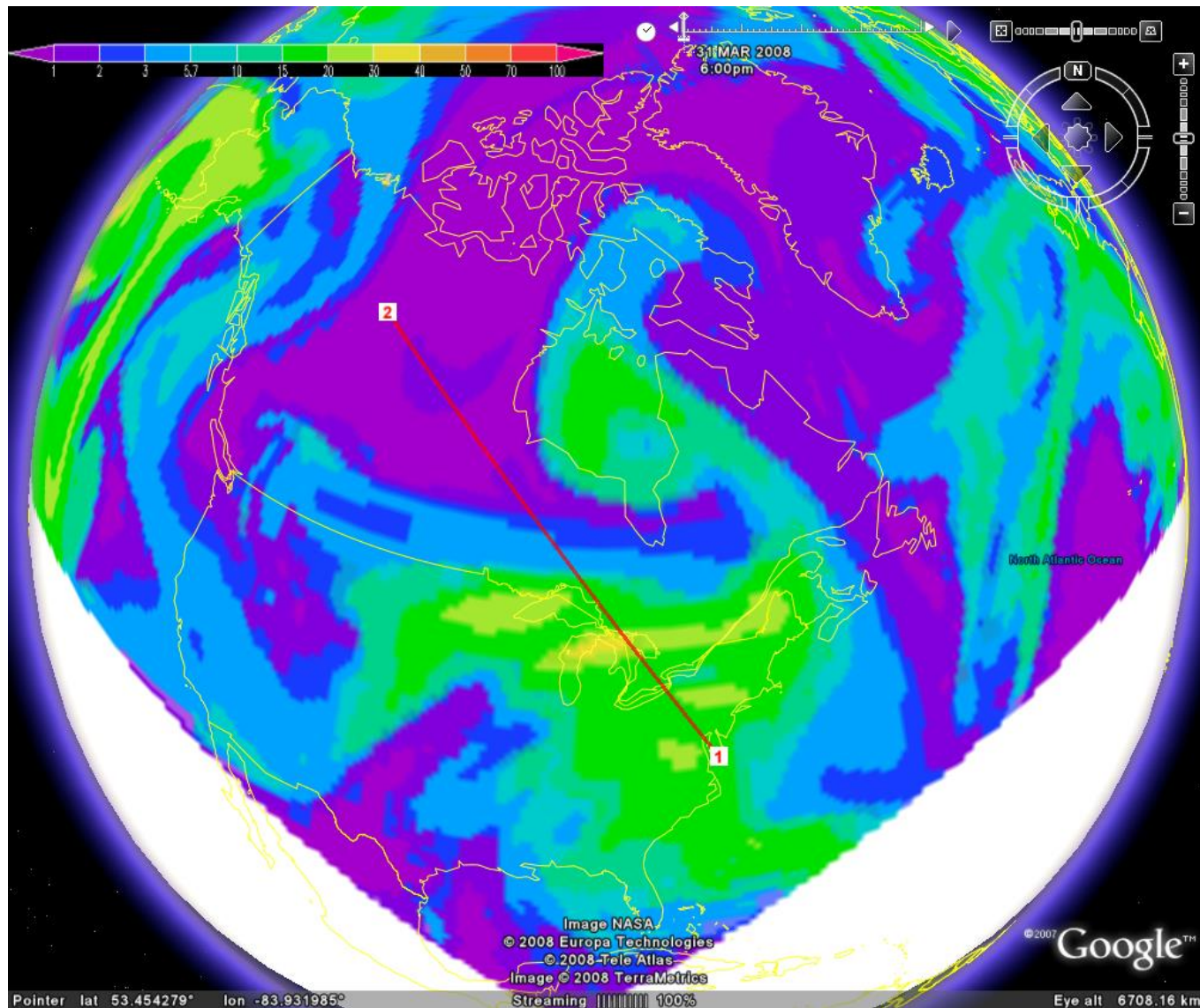
Anthropogenic CO₂, at 8.4 km, 18Z (April 1) , STEM model 66 hr forecast

DC8 April 1 curtain



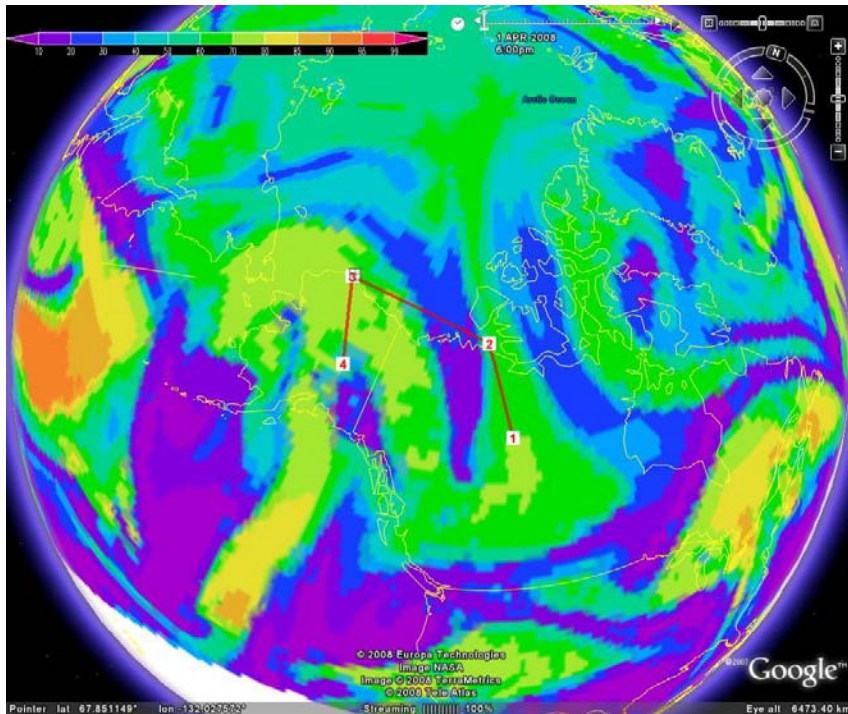
USA Asia
 Biomass China Europe

Along the flight path we see air masses from different source regions

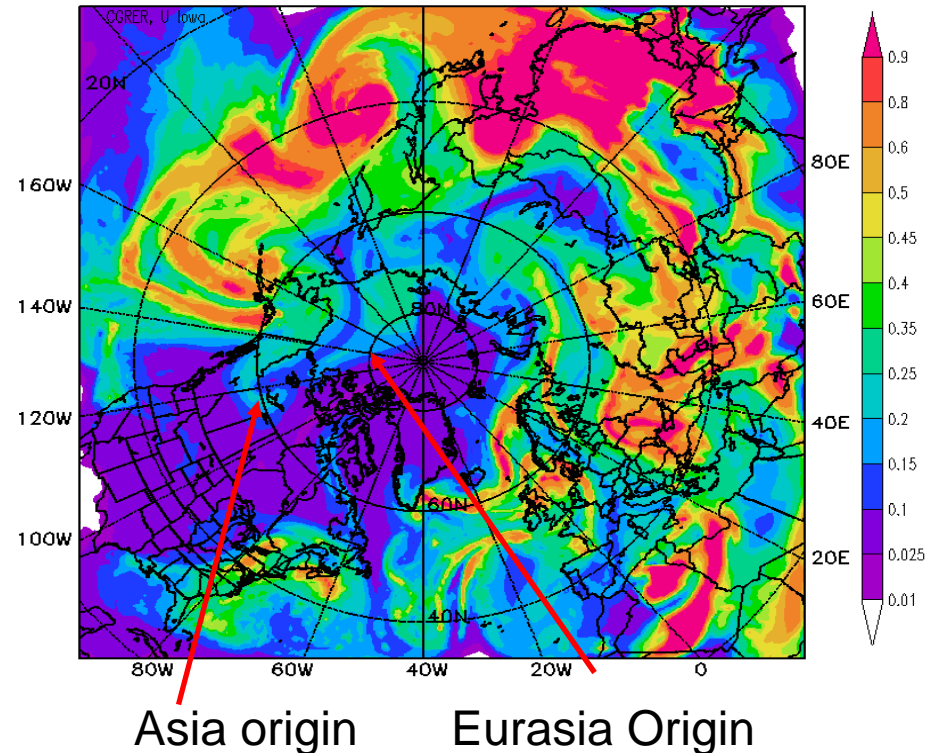


Anthropogenic CO, 5.5 km layer, 18Z 31st March,
Expect to see some N America biomass and pollution.

April 1 flight for P3



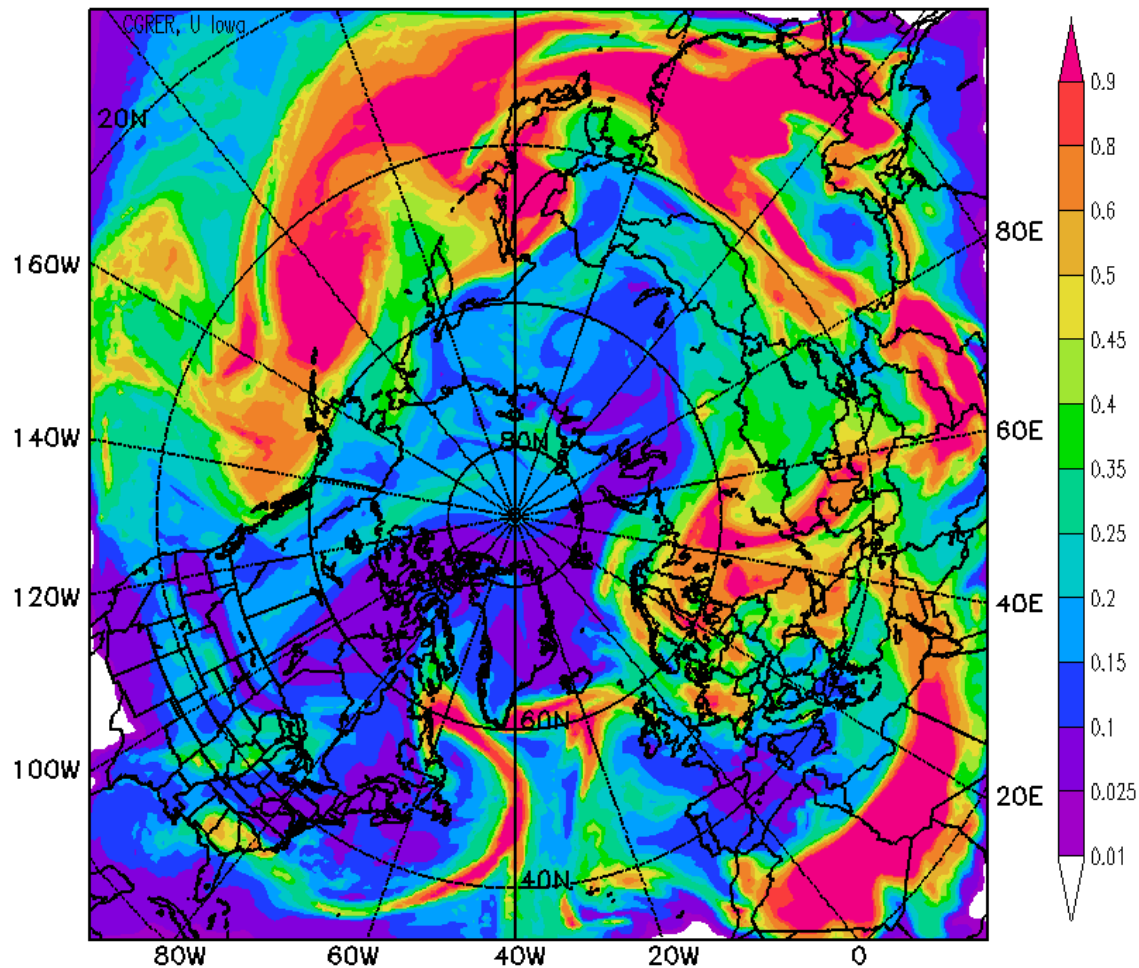
Simulated Column TOTAL Aerosol Optical Depth
at 18UTC, 4/1/2008



Left panel: RH at 5.5 KM, 18Z on April 1. Right panel: Total AOD.
Area of enhanced AOD south of Pt 2 (70 N, 120 W) is of Asia origin.
Leg from 1-2 encounters air of EurAsia origin. Area of low RH between
pts 2-3. Estimated flight time is 5.5 hours (room for spirals).

DC8 outlook for April 3

Simulated Column TOTAL Aerosol_Optical_Depth
at 18UTC, 4/3/2008

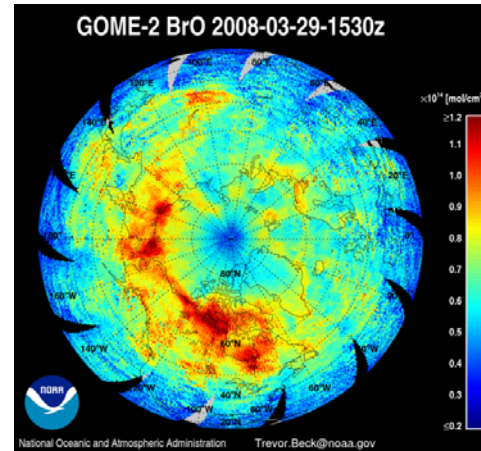
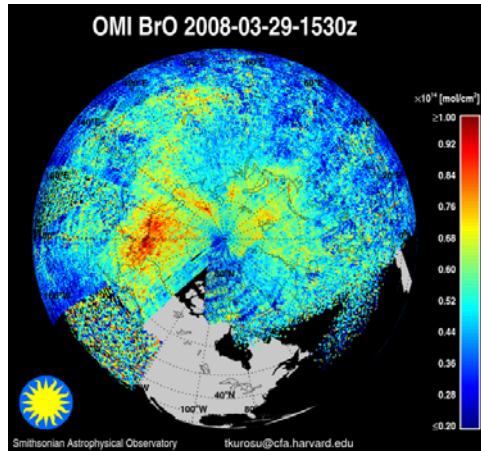


- 114 hour forecast

- From Fairbanks to Thule we expect to see elevated AOD from pollution of differing origin.

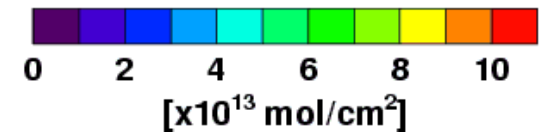
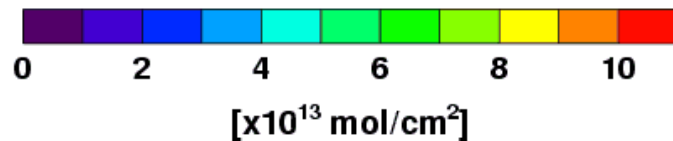
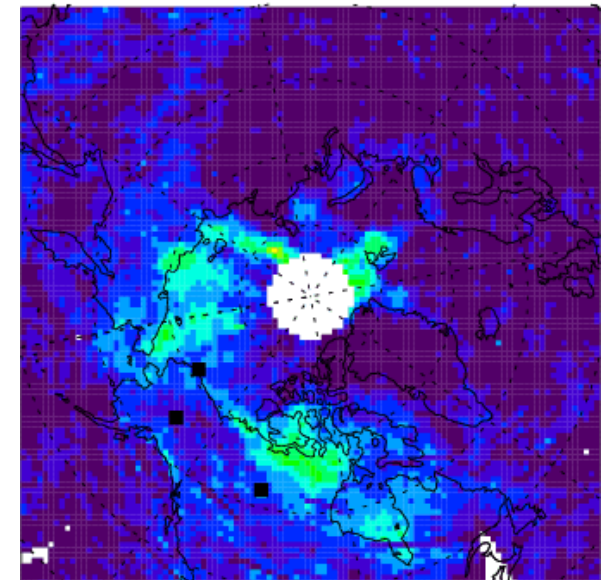
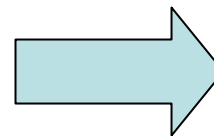
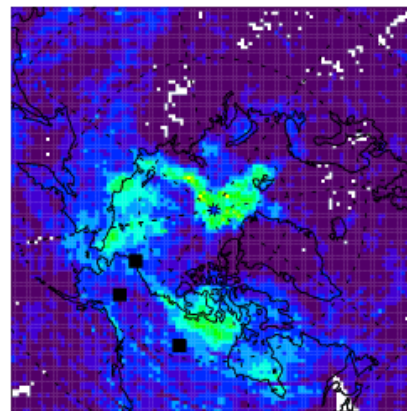
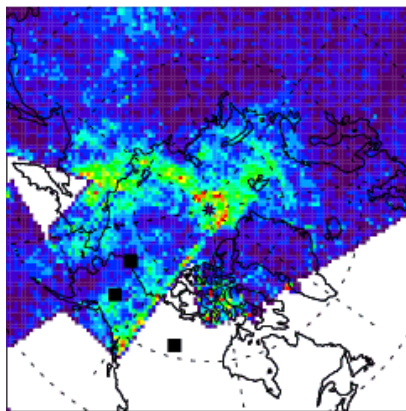
- Longitudinal gradient of Asian, European, and North American air-masses.

Total BrO columns



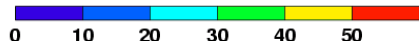
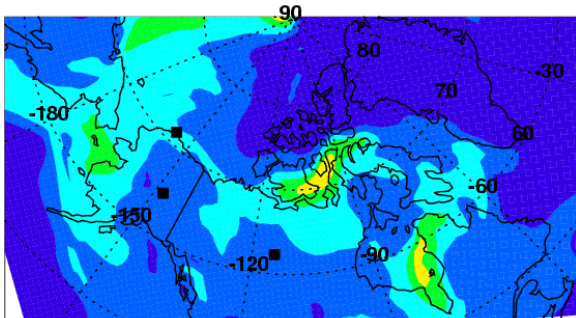
Merged BrO VCD
as model input

Boundary BrO columns

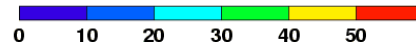
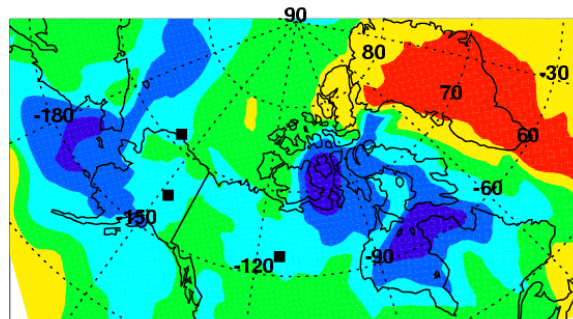


Surface Ozone forecast at noon in 4 days

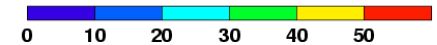
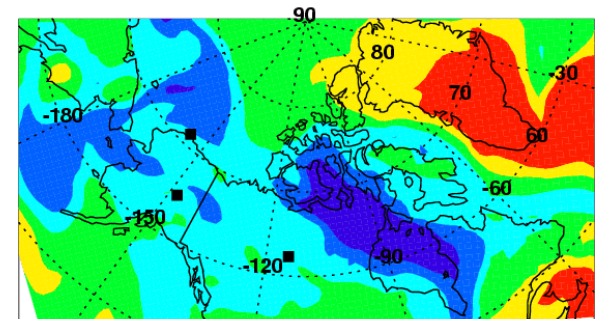
BrO on March, 29



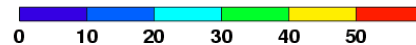
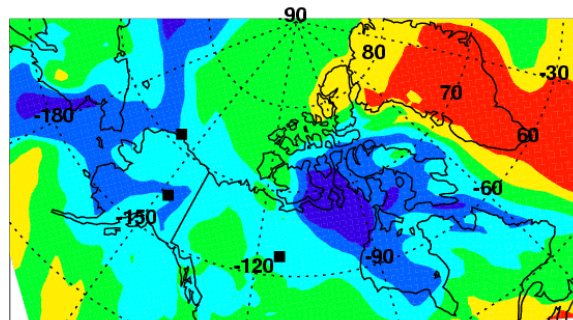
O₃ (ppbv) at surface, Mar-30_2000 UTC



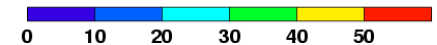
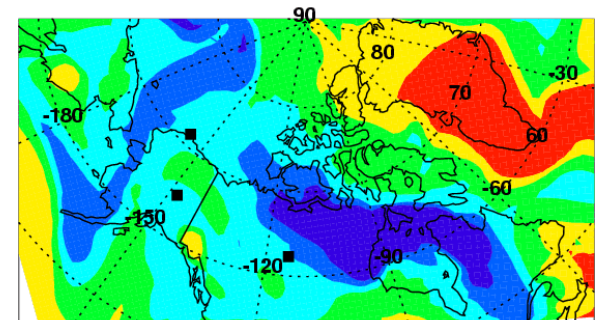
O₃ (ppbv) at surface, Apr-01_2000 UTC



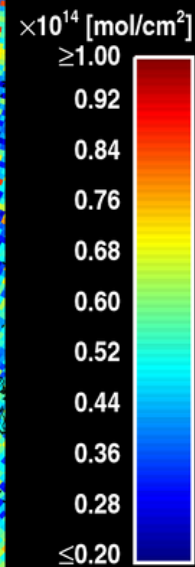
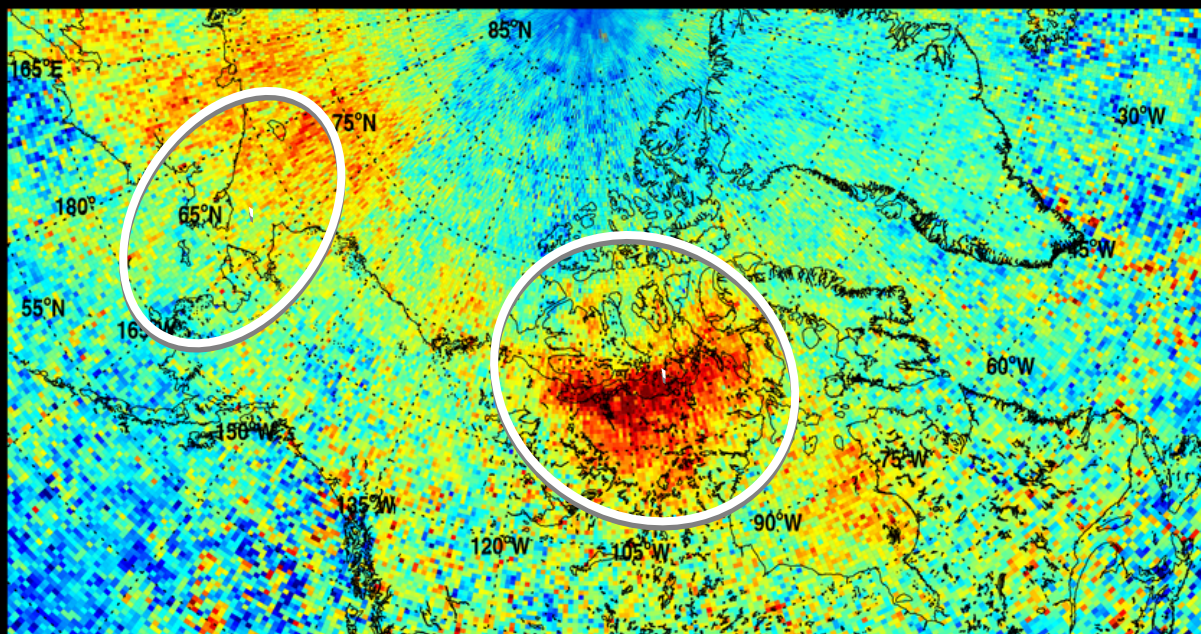
O₃ (ppbv) at surface, Mar-31_2000 UTC



O₃ (ppbv) at surface, Apr-02_2000 UTC

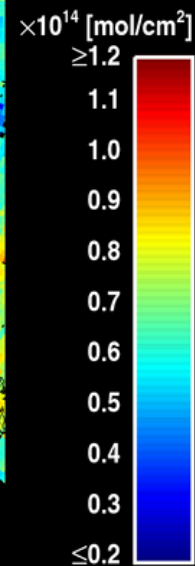
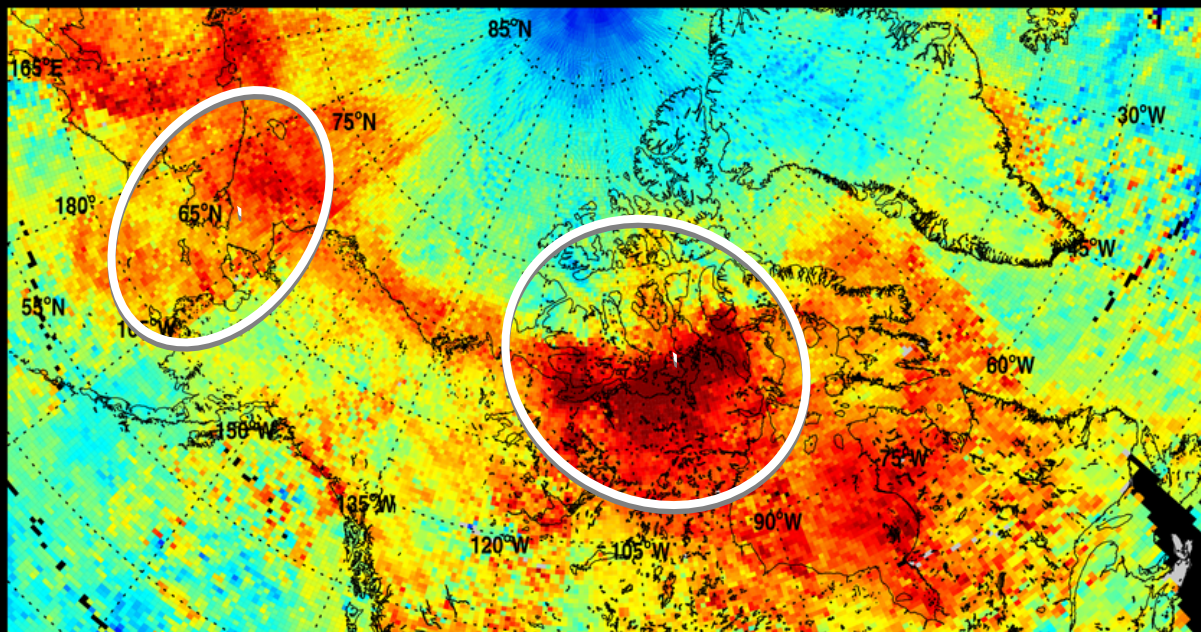


OMI BrO 2008-03-30-1530z



BrO columns have decreased since 3/28

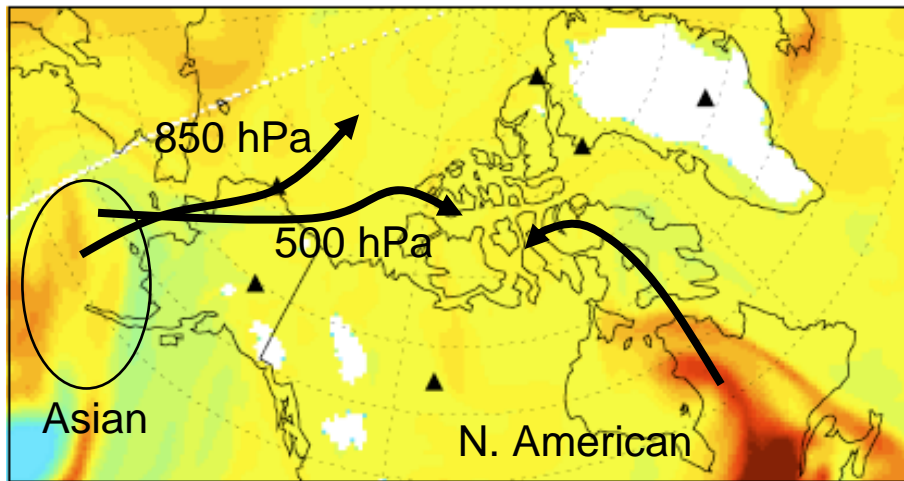
GOME-2 BrO 2008-03-30-1530z



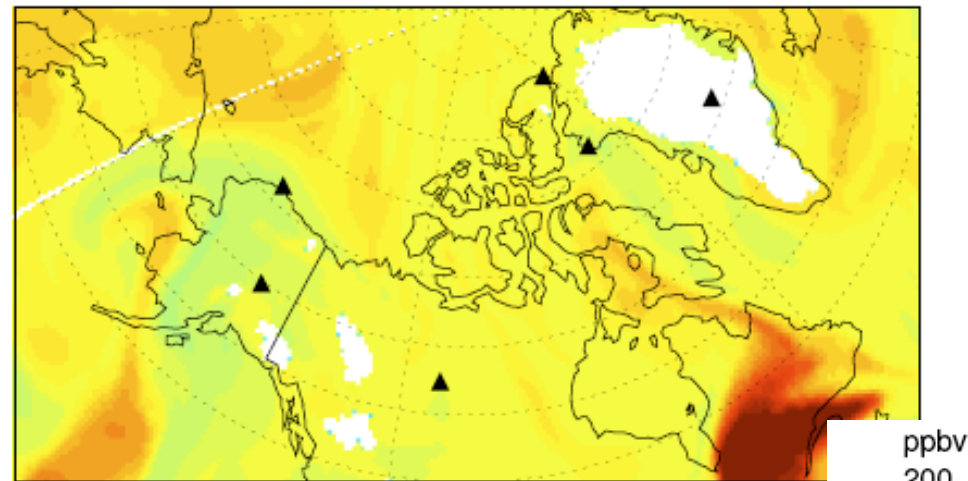
Bering Strait and Queen Elizabeth Islands

GEOS Total CO 850 hPa

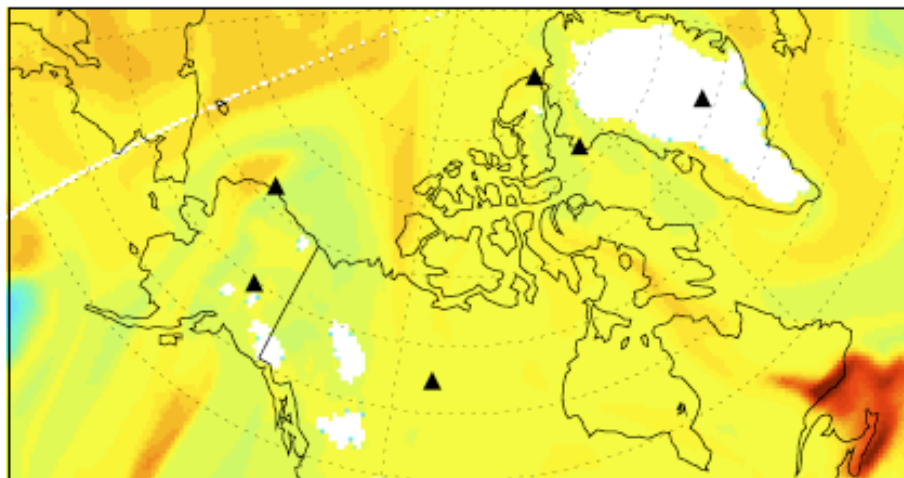
3/31



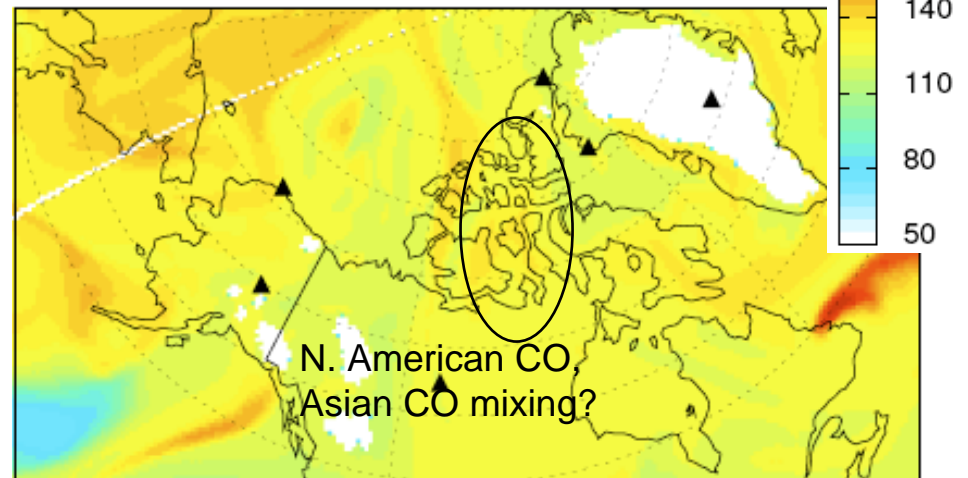
4/1



4/2



4/3



GEOS Asian CO 500 hPa

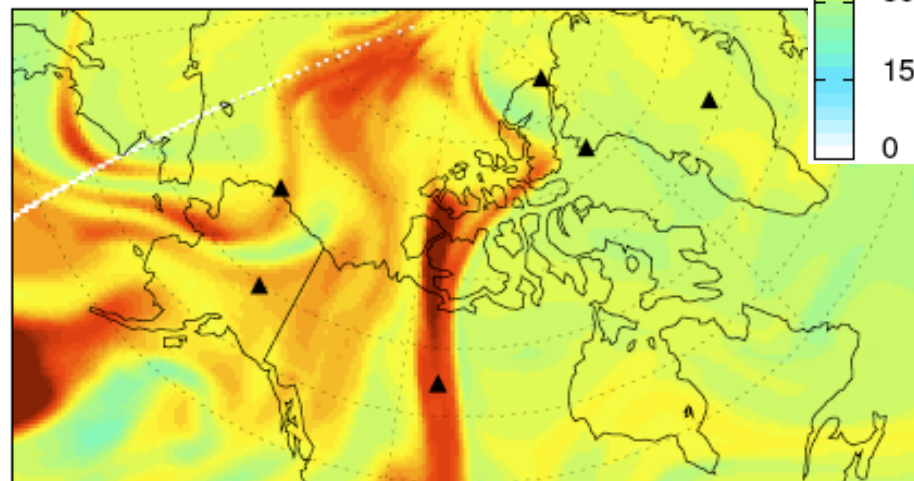
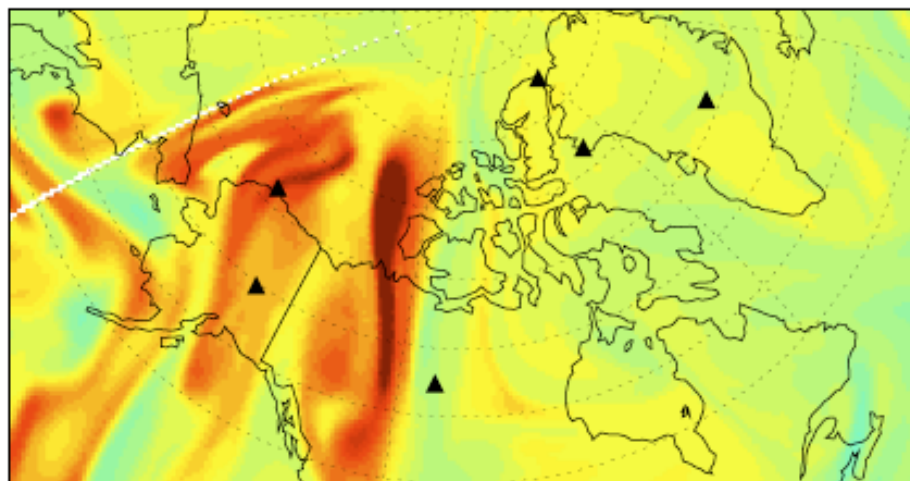
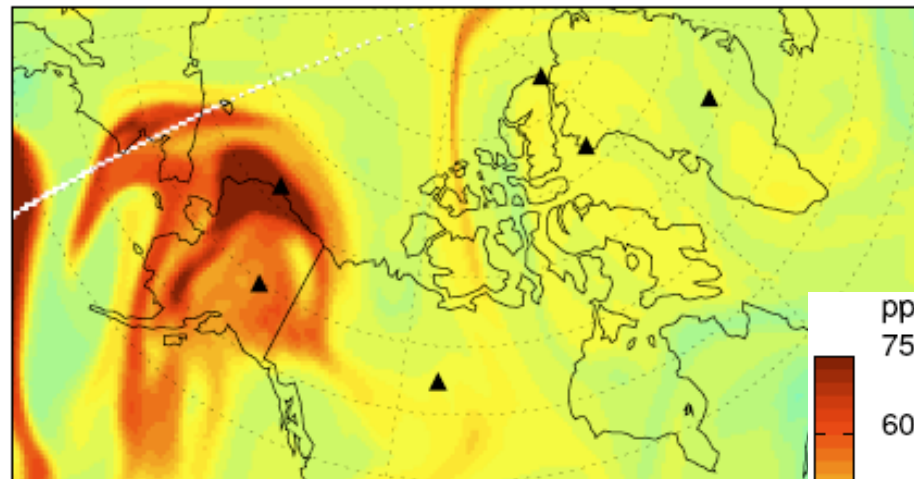
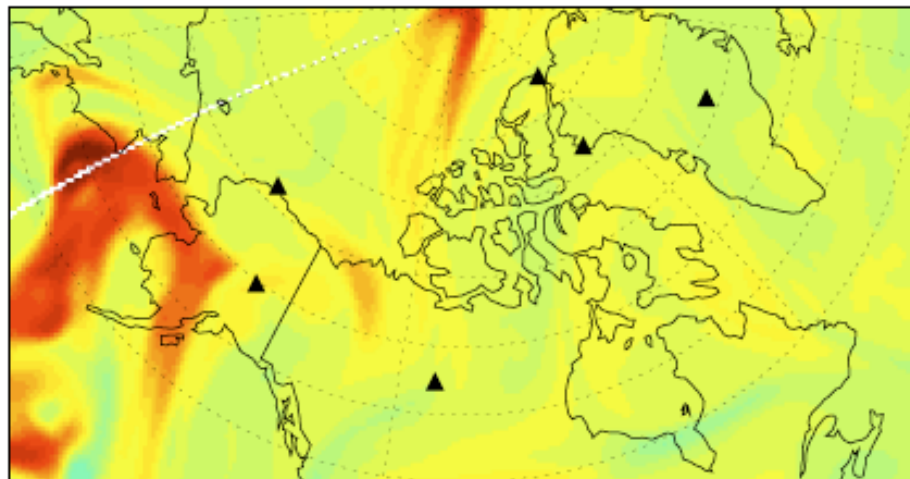
3/31

4/1

4/2

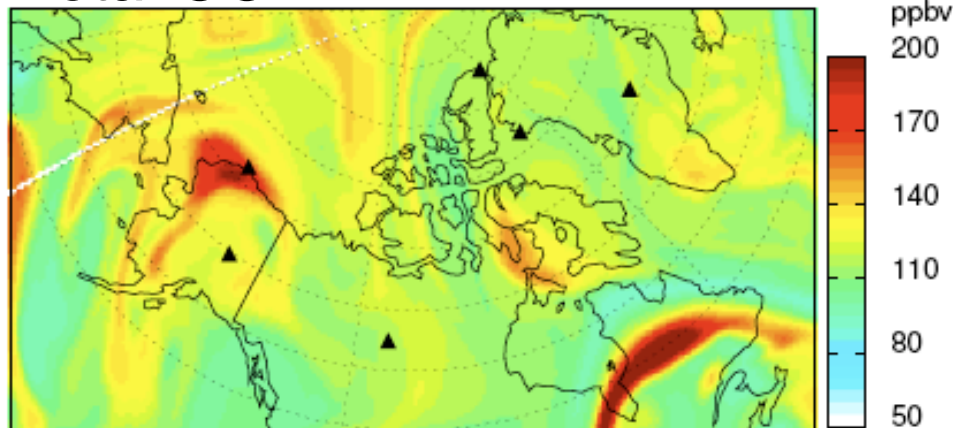
4/3

ppbv
75
60
45
30
15
0

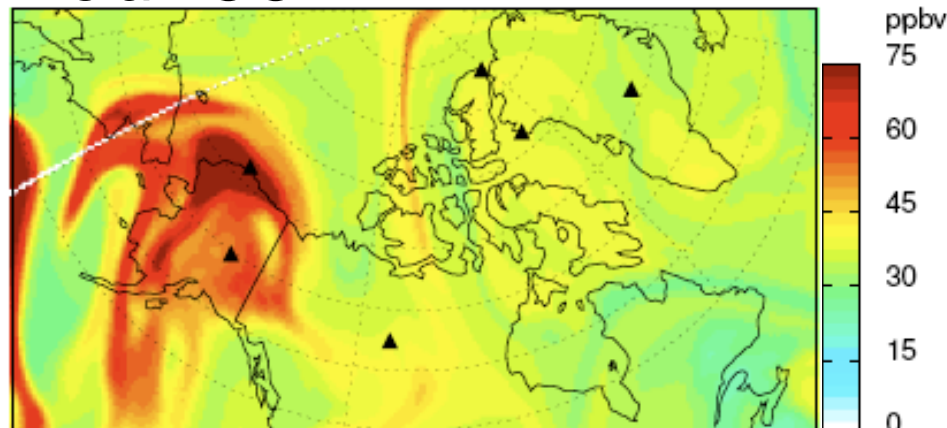


Asian pollution over Barrow on 4/01 - P3 Flight Opportunity?

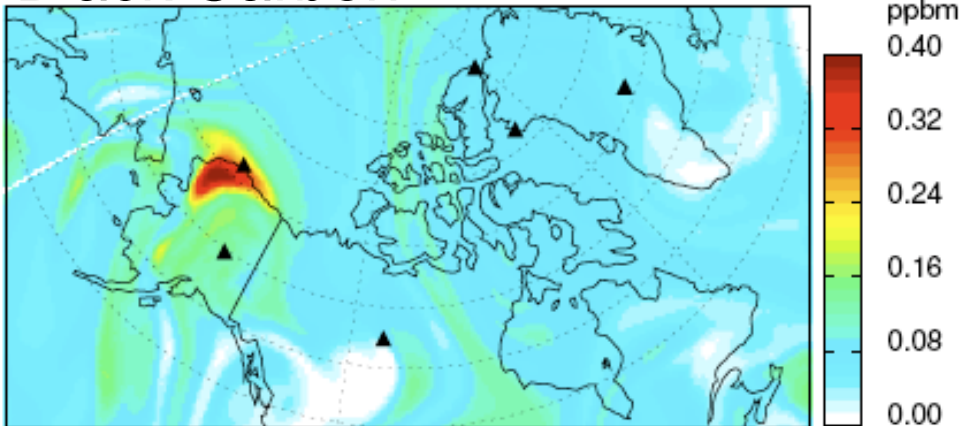
Total CO



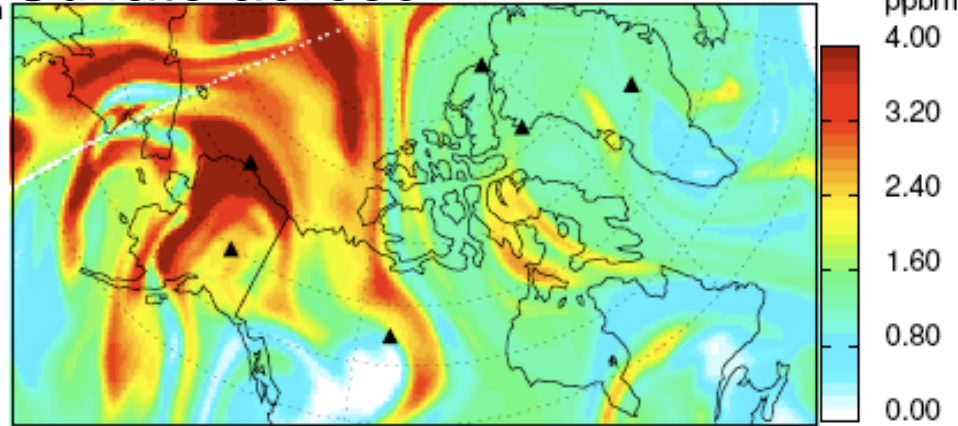
Asian CO



Black Carbon

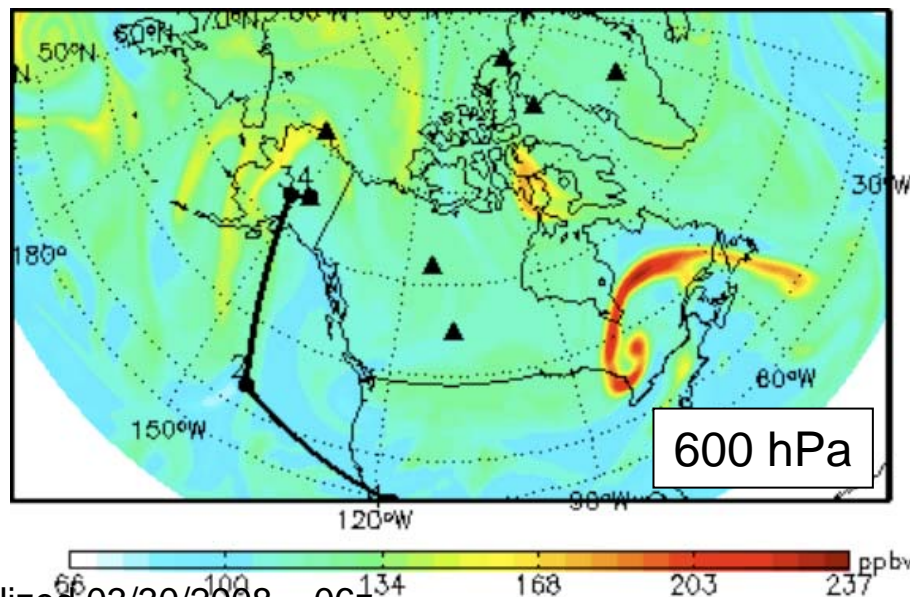
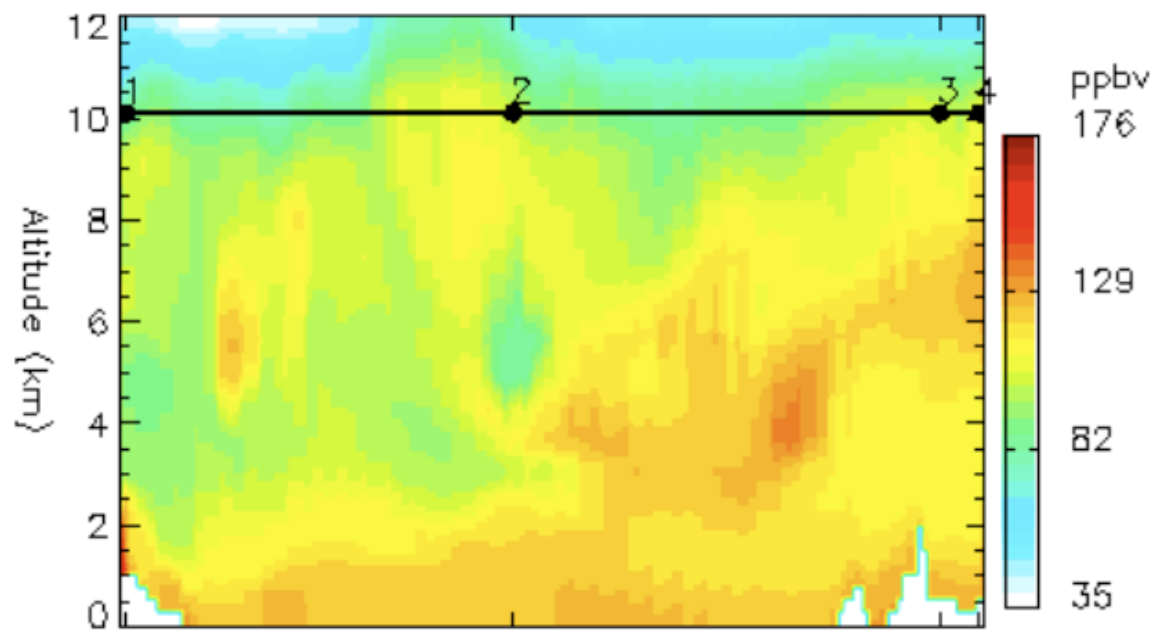


Sulfate aerosol



All 500 hPa

CO along proposed DC8 flight track



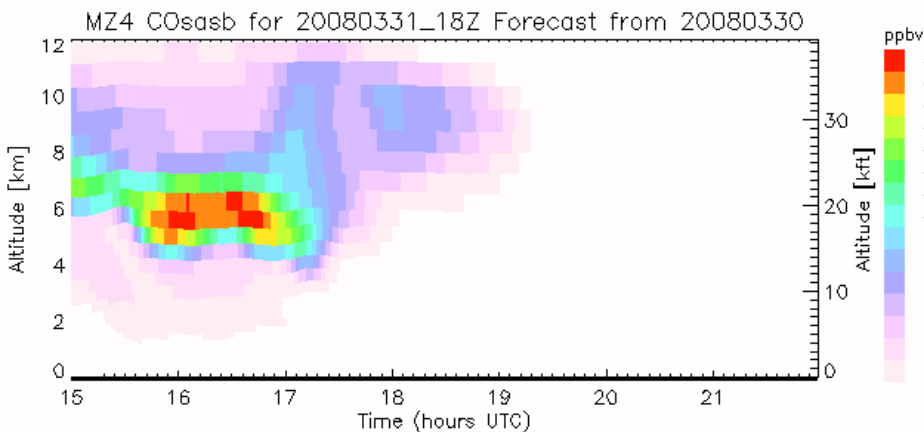
Initialized 03/30/2008 – 06Z

Mar 31 P-3 Wallops to Yellowknife

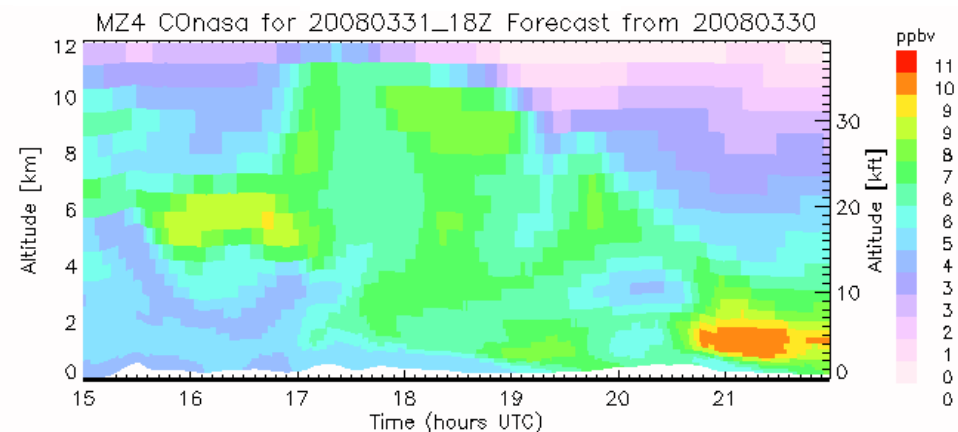
MOZART-4/GFS forecasts from Mar 30 for Mar 31 18Z

- Biomass burning plume from S. Asia at 6 km over Great Lakes
- N.Asia anthro plume at low alts on approach to Yellowknife

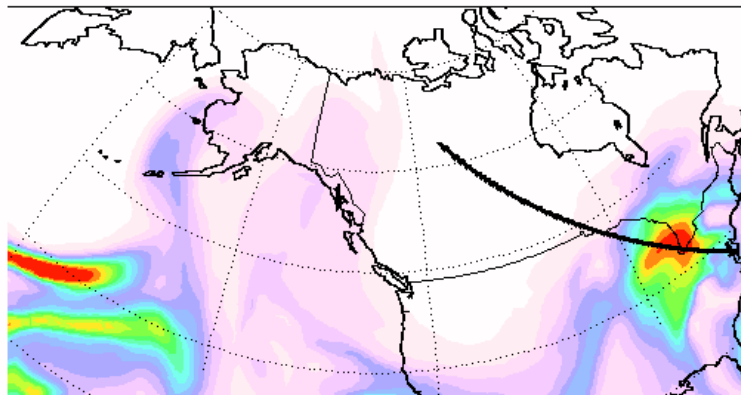
S.Asia Fires



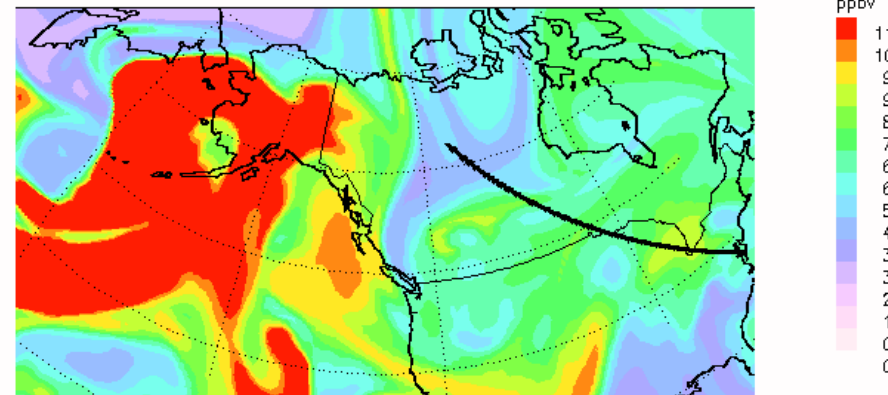
N.Asia Anthro



CO_{asb} 6 km 20080331_18Z



CO_{nasa} 6 km 20080331_18Z

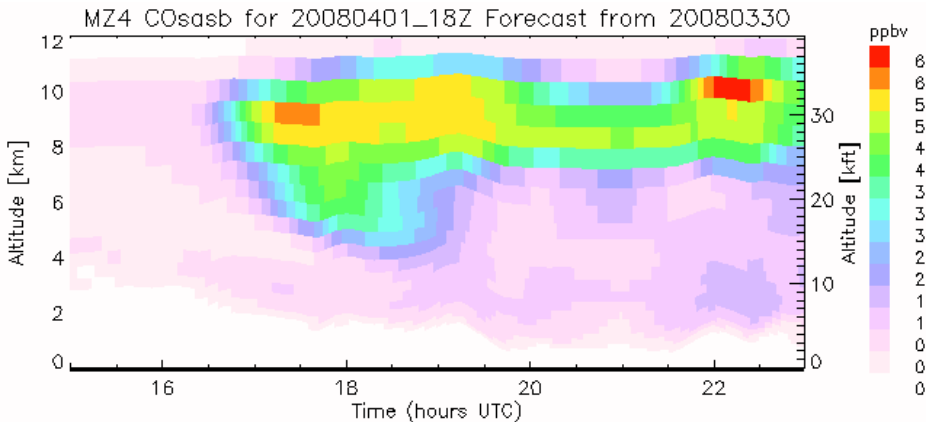


Apr 1 P-3 Yellowknife to Fairbanks via Barrow

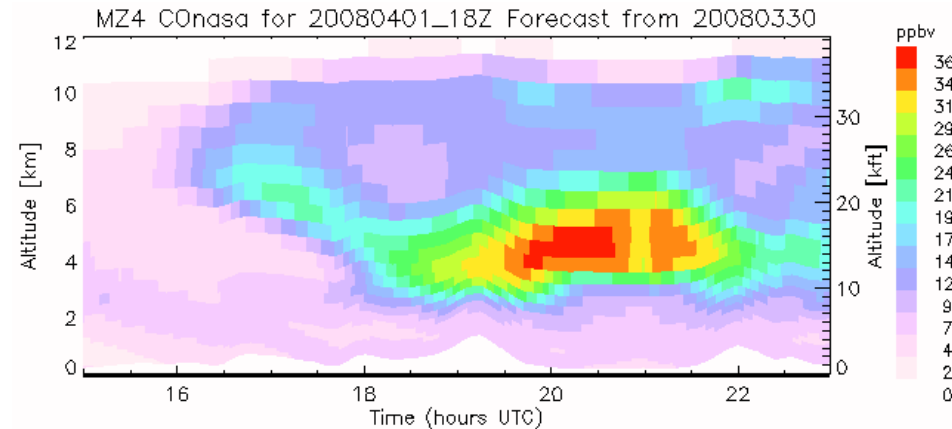
MOZART-4/GFS forecasts from Mar 30 for Mar 31 18Z

- Biomass burning plume from S. Asia at altitude on transit to Barrow
- Anthro Asian pollution 4-6 km over Barrow

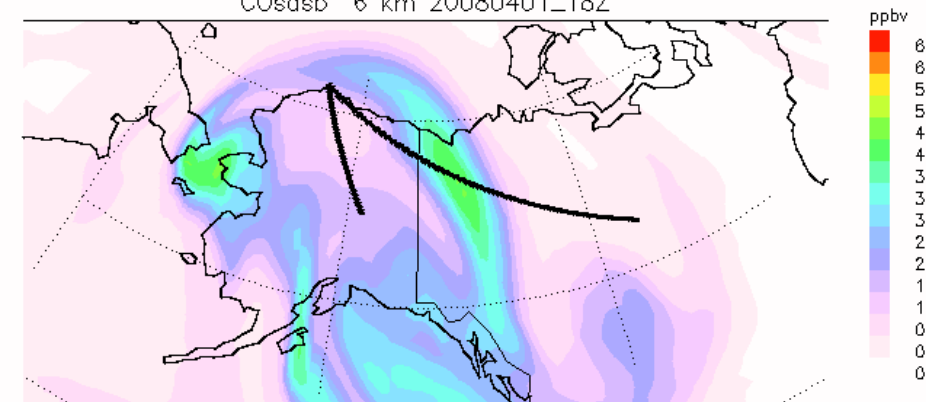
S.Asia Fires



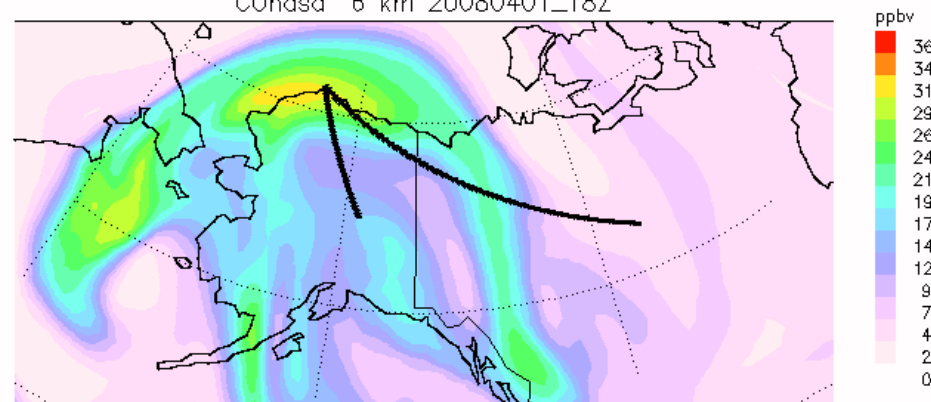
N.Asia Anthro



CO_{sasb} 6 km 20080401_18Z



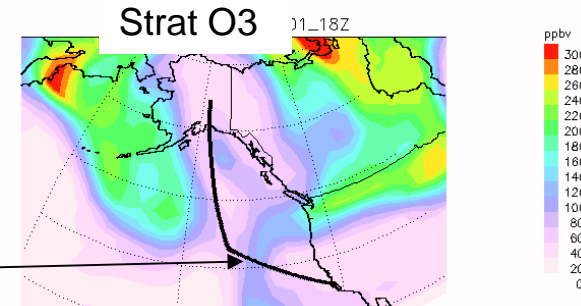
CO_{nasa} 6 km 20080401_18Z



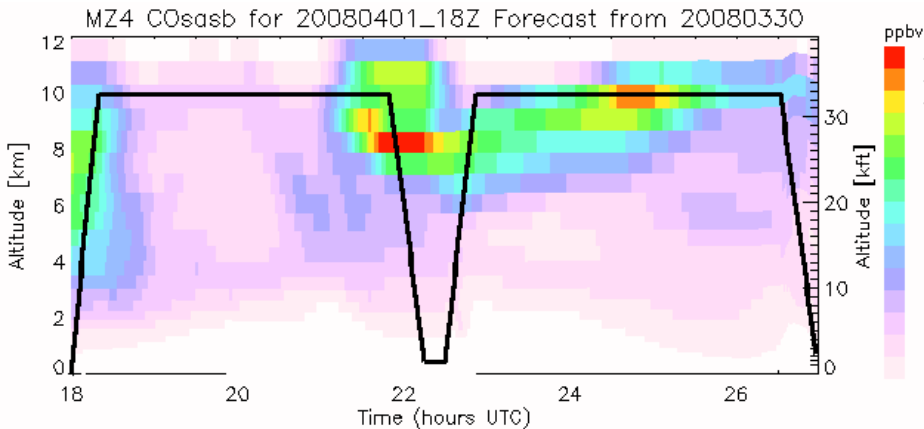
Apr 1 DC-8 Palmdale to Fairbanks

MOZART-4/GFS forecasts from Mar 30 for Mar 31 18Z

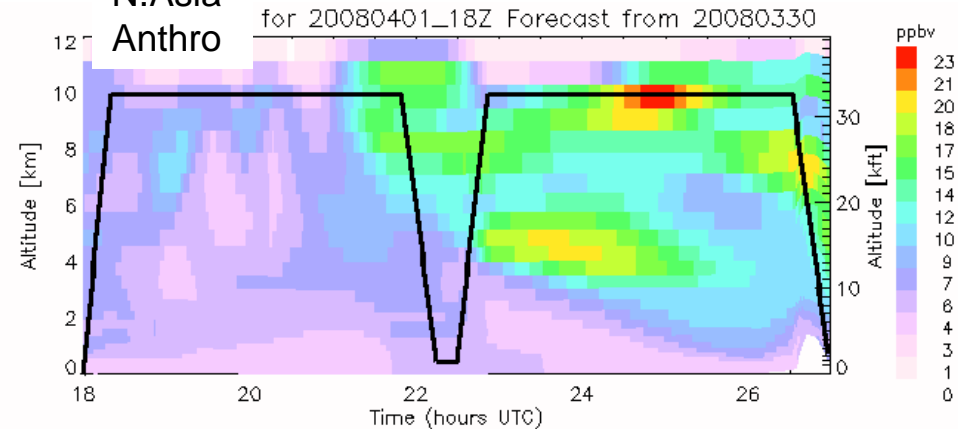
- May encounter biomass burning plume from S. Asia on spiral and on north leg
- N.Asia and S. Asia anthro mixed in
- Weak Strat O3 intrusion on first leg



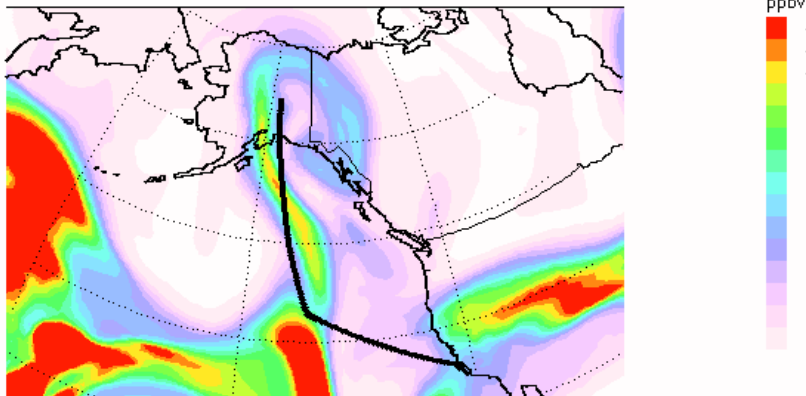
S.Asia Fires



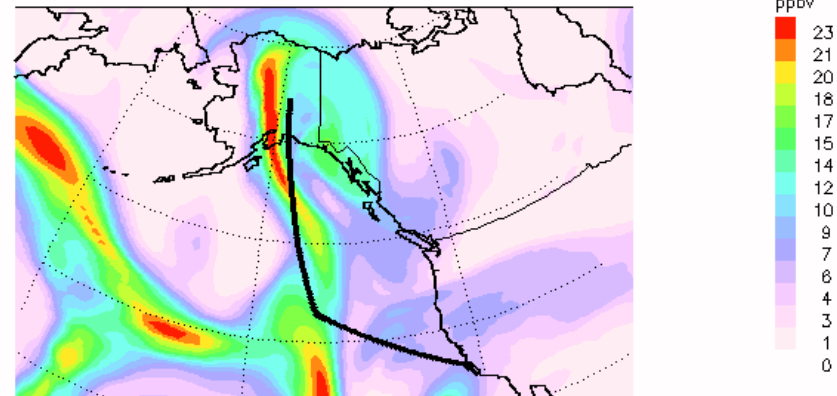
N.Asia Anthro



CO_{asb} 10 km 20080401_18Z

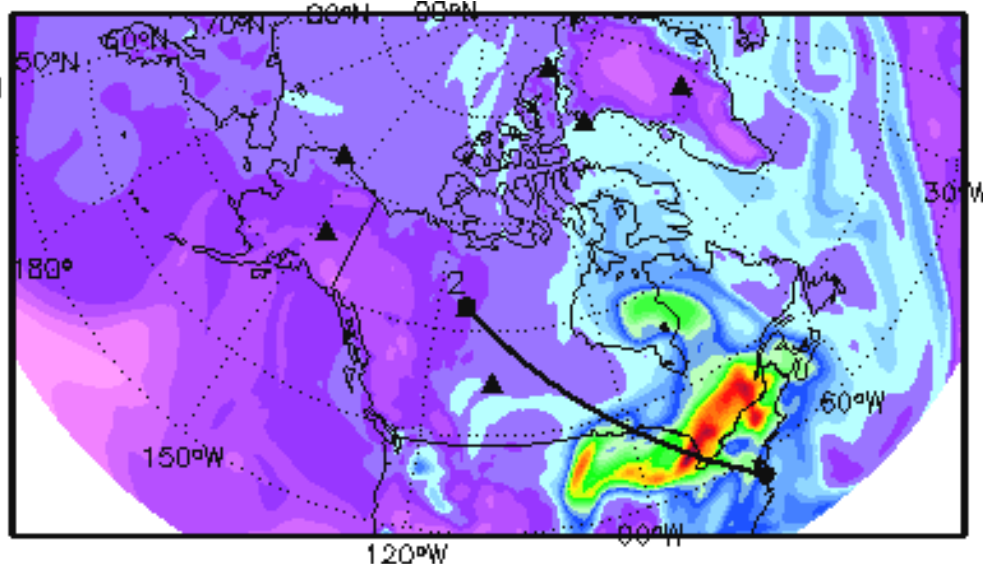


CO_{nasa} 10 km 20080401_18Z

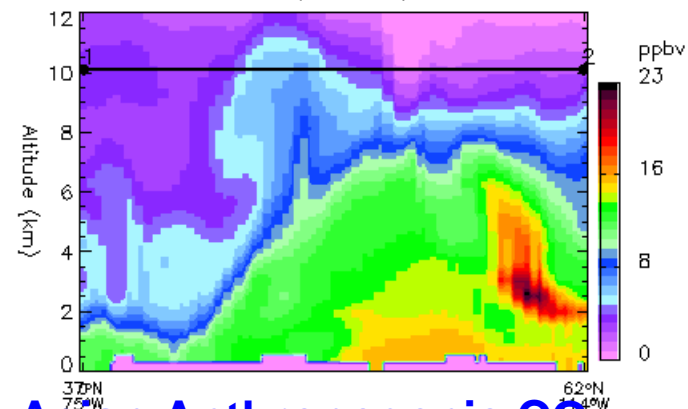


GEOS-5 CO forecasts
forecast from 20080330_06Z

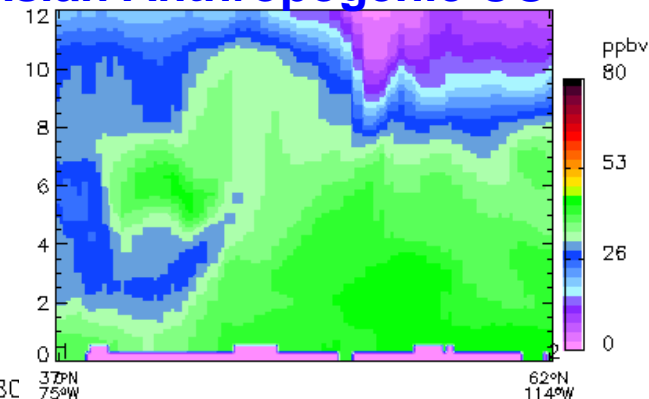
Wallops to Yellowknife 3/31



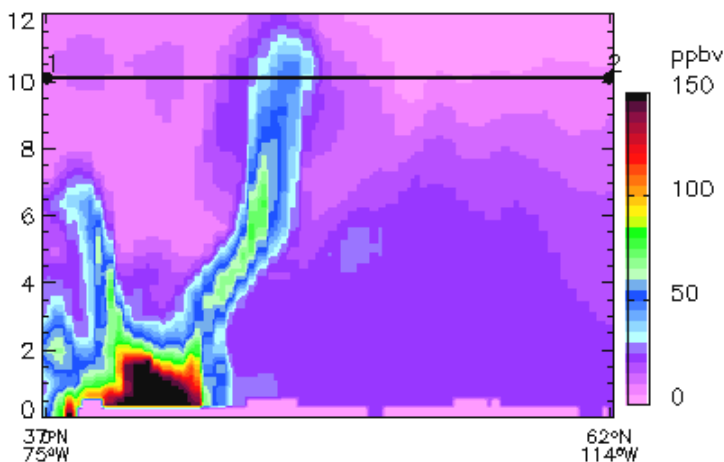
European Anthropogenic CO



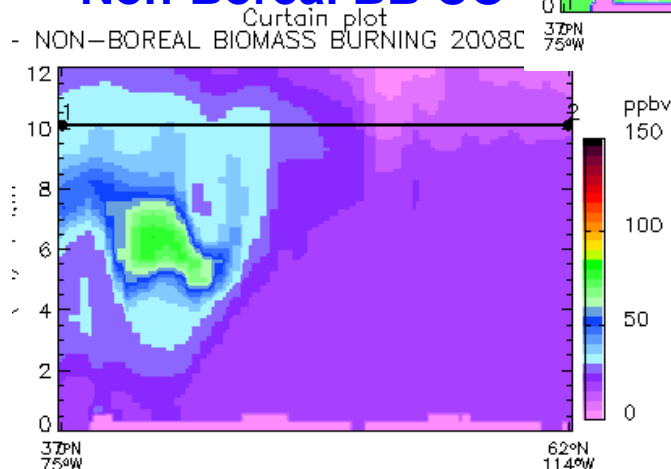
Asian Anthropogenic CO



N. American Anthropogenic CO



Non-Boreal BB CO

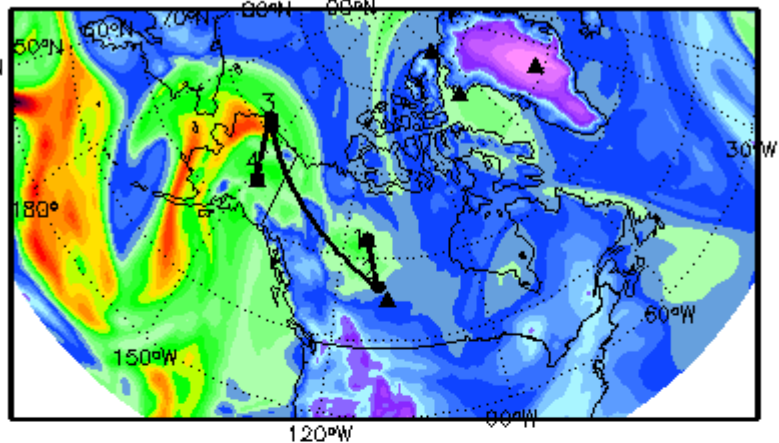


Yellowknife to Fairbanks 4/1

Asian Anthropogenic CO

GEOS-5 forecast: 20080330_06z

CO COLUMN BURDEN (ASIA ANTHROPOGENIC)
20080401 16:30Z

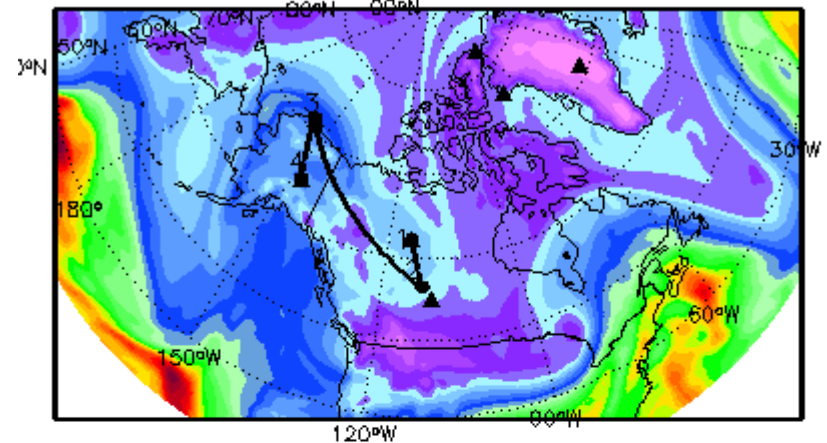


1.30e-04 2.11e-04 2.92e-04 3.73e-04 4.54e-04 5.35e-04 kg/m²

Asian Biomass Burning CO

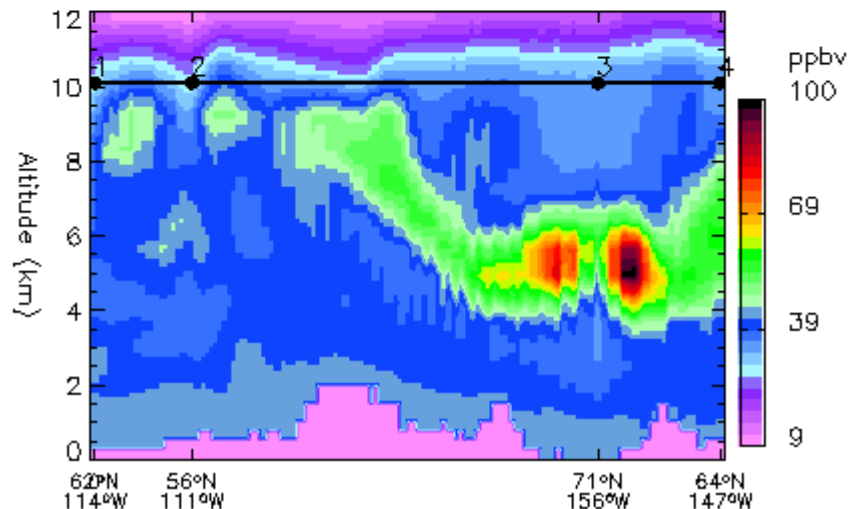
GEOS-5 forecast: 20080330_06z

CO COLUMN BURDEN (NON-BOREAL BIOMASS BURNING)
20080401 16:30Z

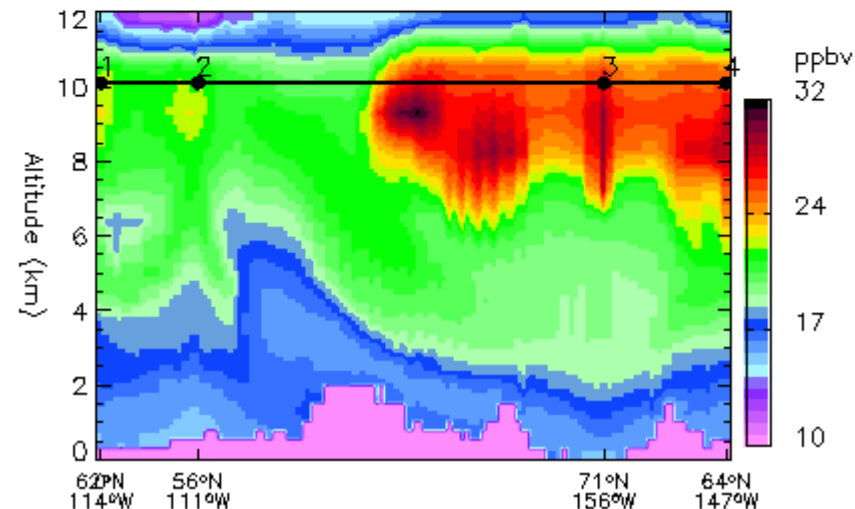


8.49e-05 1.41e-04 1.97e-04 2.53e-04 3.09e-04 3.65e-04 kg/m²

Curtain plot
CO - ANTHOPOGENIC (ASIA) 20080401 16:30Z



Curtain plot
CO - NON-BOREAL BIOMASS BURNING 20080401 16:30Z

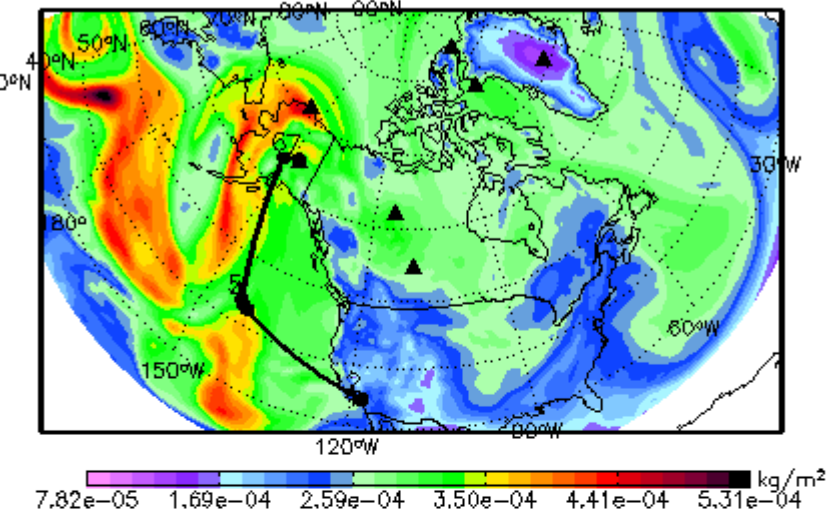


Palmdale to Fairbanks 4/1

Asian Anthropogenic CO

GEOS-5 forecast: 20080330_06z

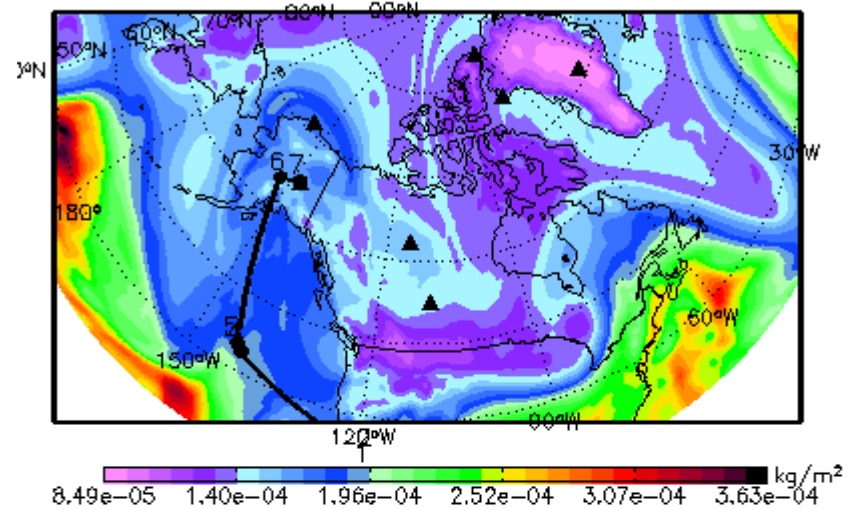
CO COLUMN BURDEN (ASIA ANTHROPOGENIC)
20080401 19:30Z



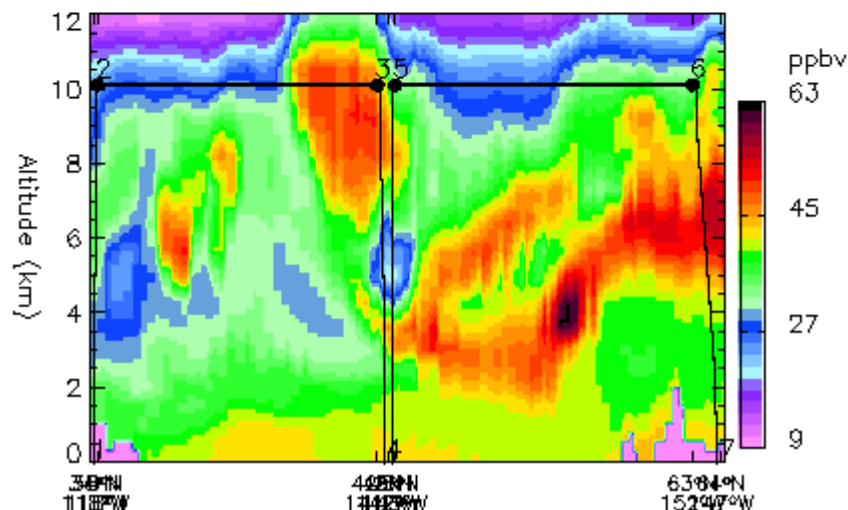
Non-Boreal Biomass Burning CO

GEOS-5 forecast: 20080330_06z

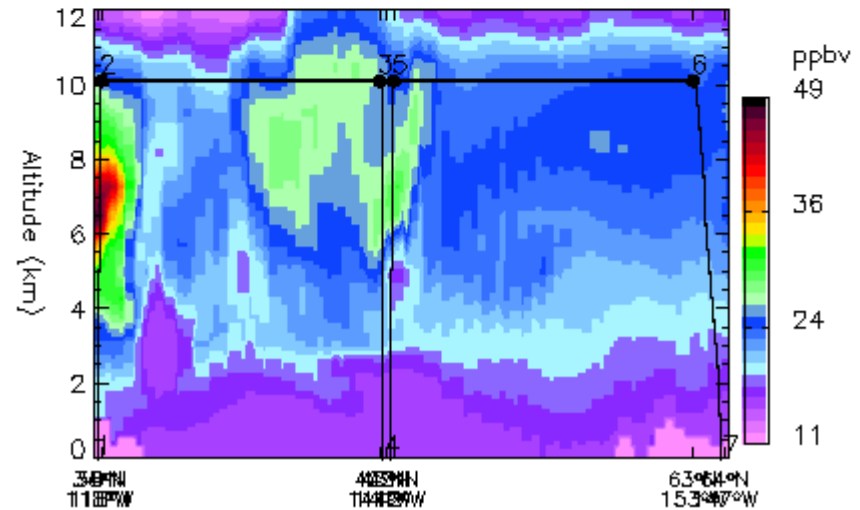
CO COLUMN BURDEN (NON-BOREAL BIOMASS BURNING)
20080401 19:30Z

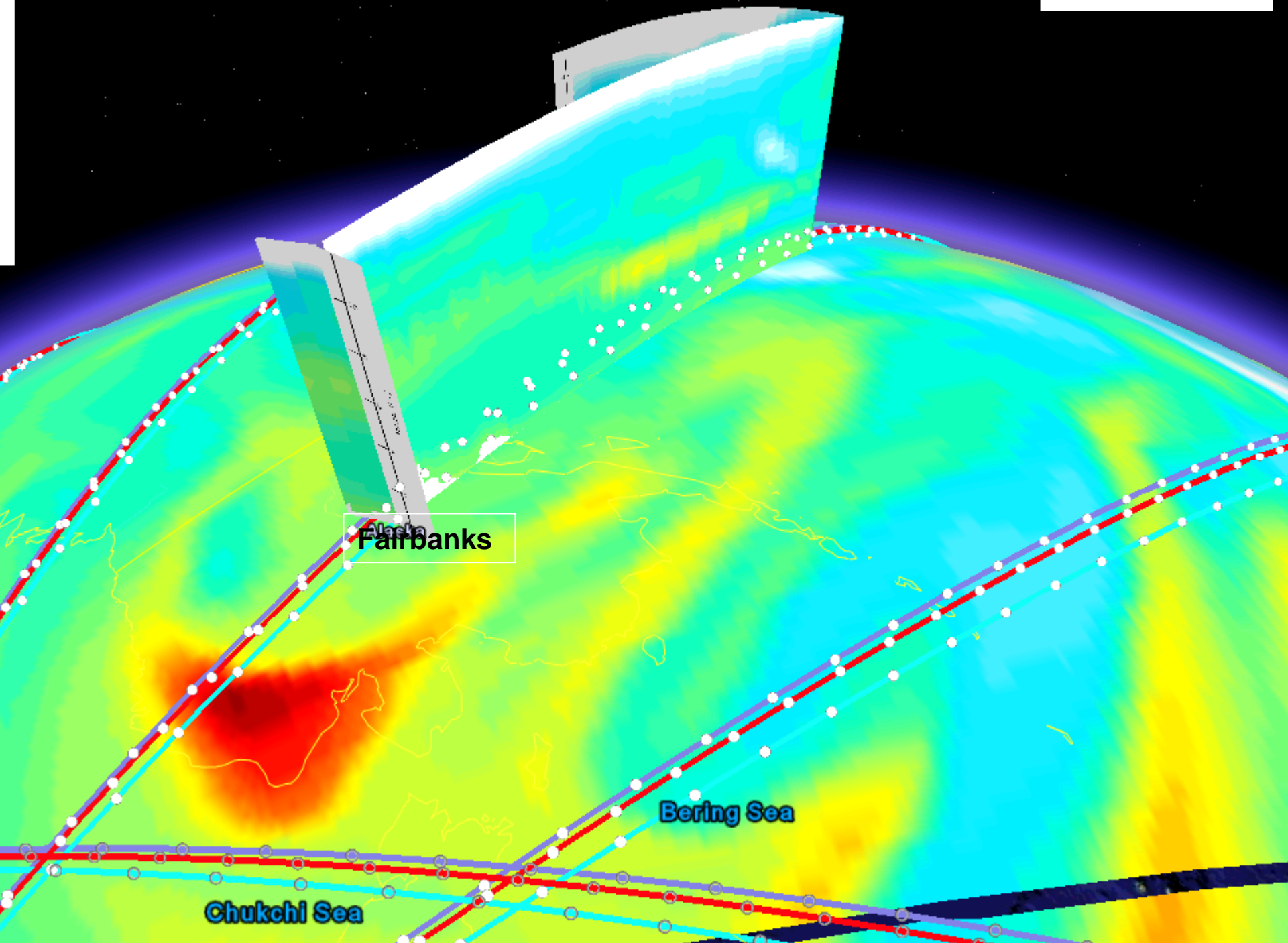


Curtain plot
CO - ANTHOPOGENIC (ASIA) 20080401 19:30Z

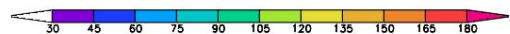
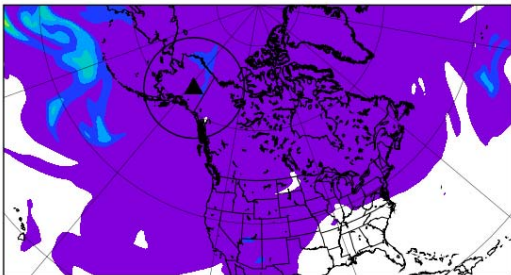


Curtain plot
CO - NON-BOREAL BIOMASS BURNING 20080401 19:30Z

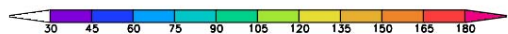
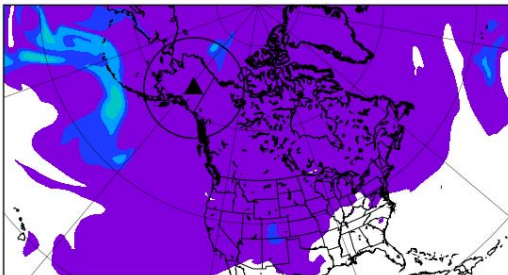




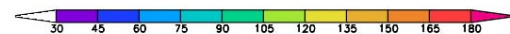
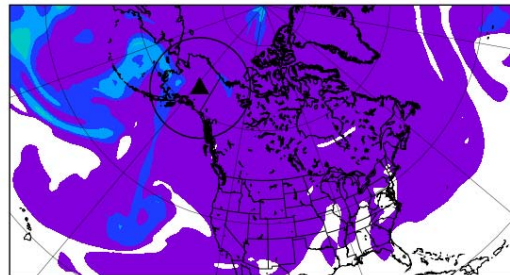
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
07:30Z30MAR2008



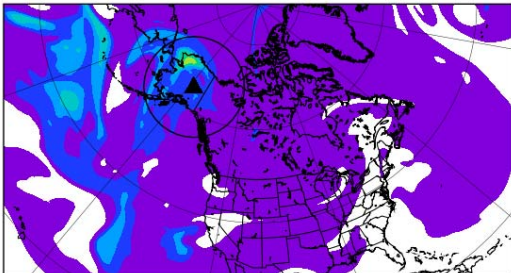
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z30MAR2008



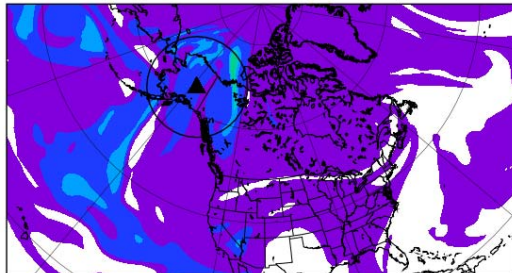
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z31MAR2008



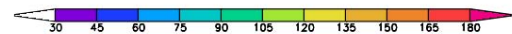
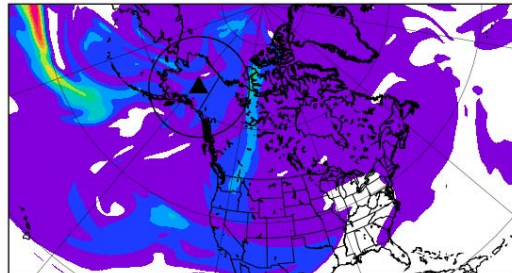
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z01APR2008



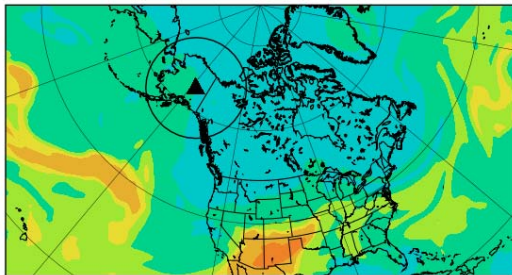
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z02APR2008



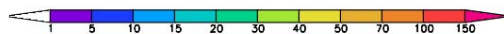
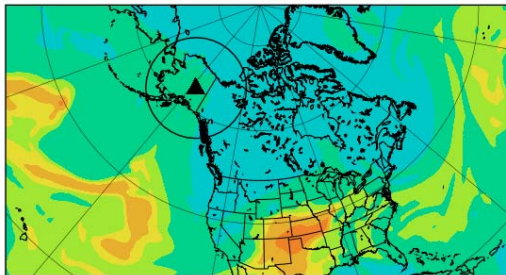
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z03APR2008



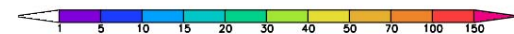
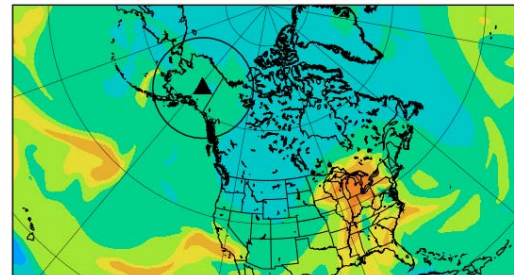
CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
07:30Z30MAR2008



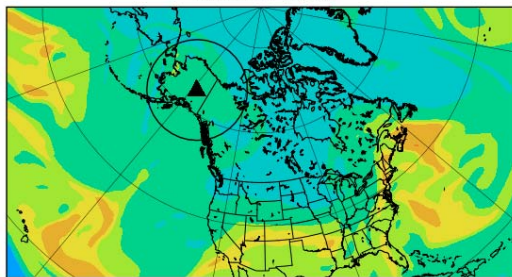
CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z30MAR2008



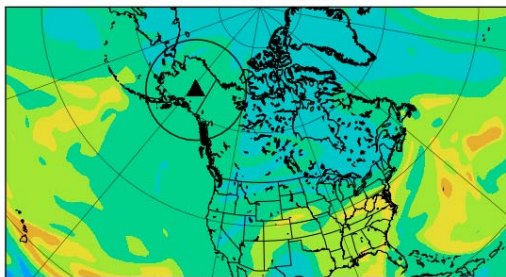
CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z31MAR2008



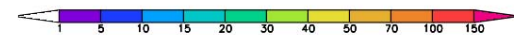
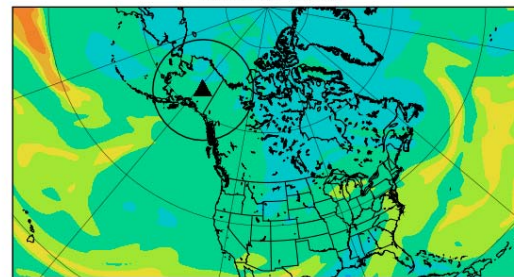
CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z01APR2008



CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z02APR2008



CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z03APR2008



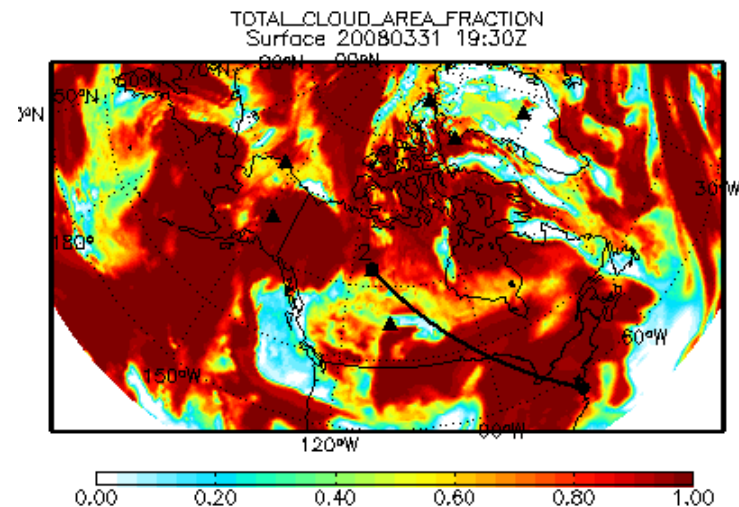
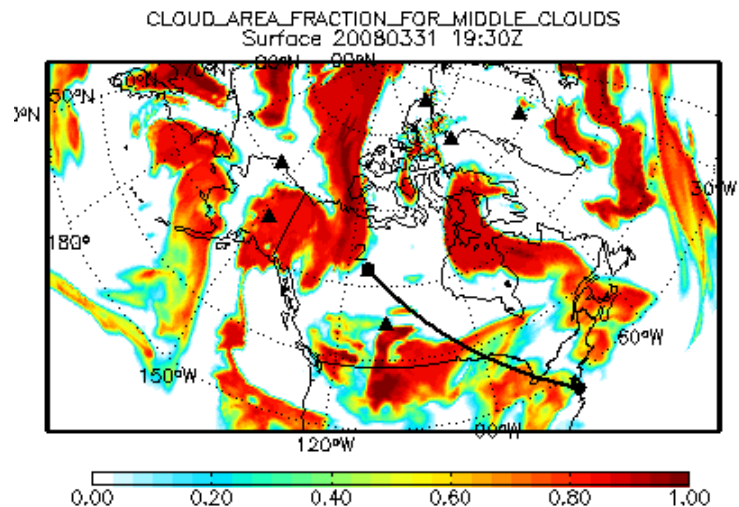
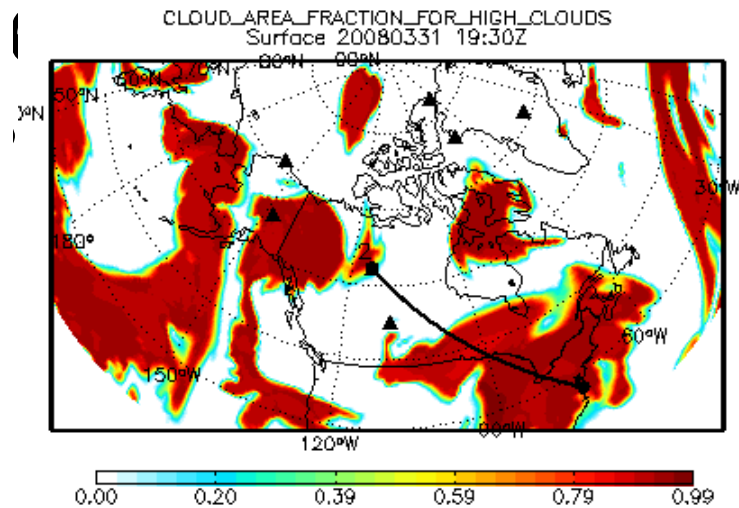
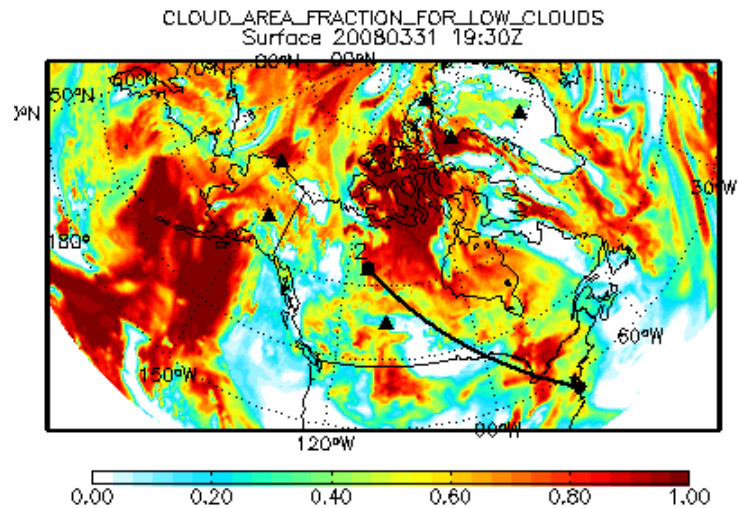
GEOS-5 Aerosol forecasts
forecast from 20080330_06Z

Take off from Wallops (37.94N, 75.46W): 1100 LT

– 1500 UTC

GEOS-5 forecast: 20080330_06z

GEOS-5 forecast: 20080330_06z

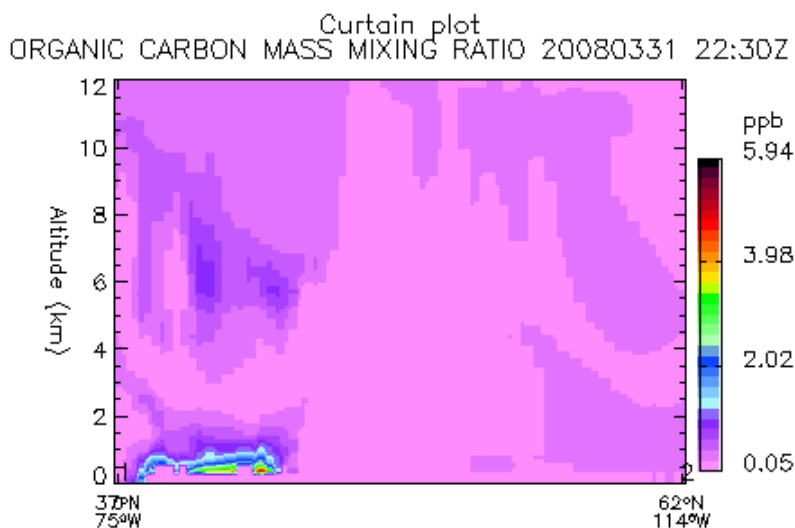
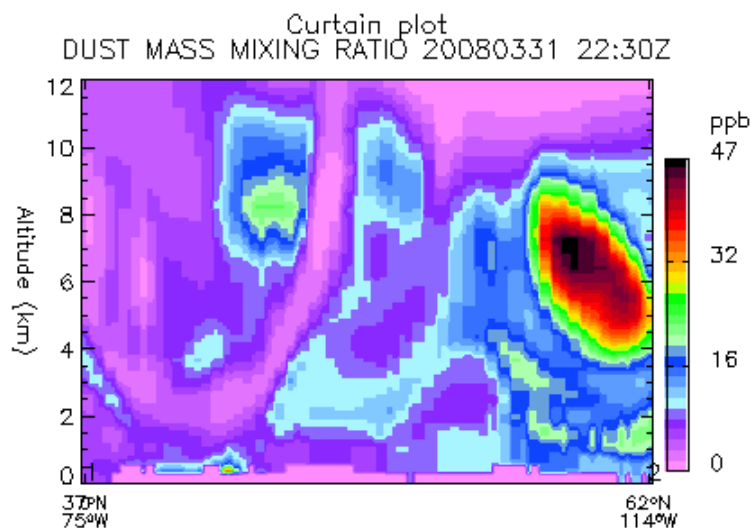
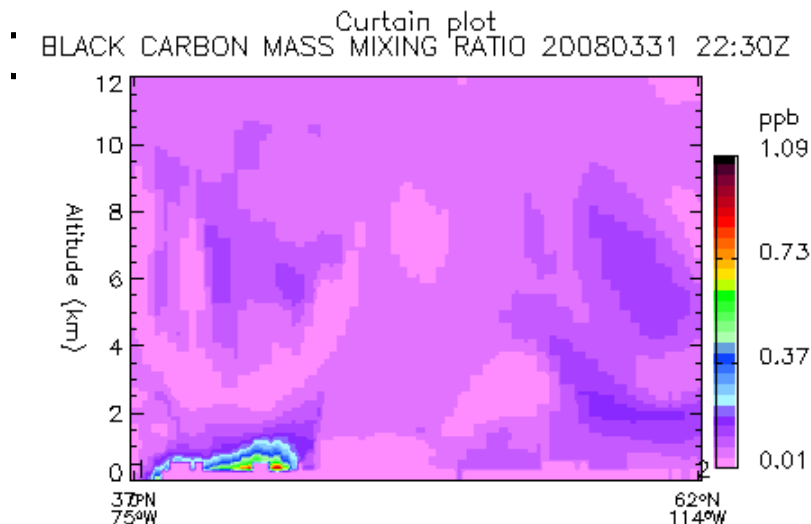
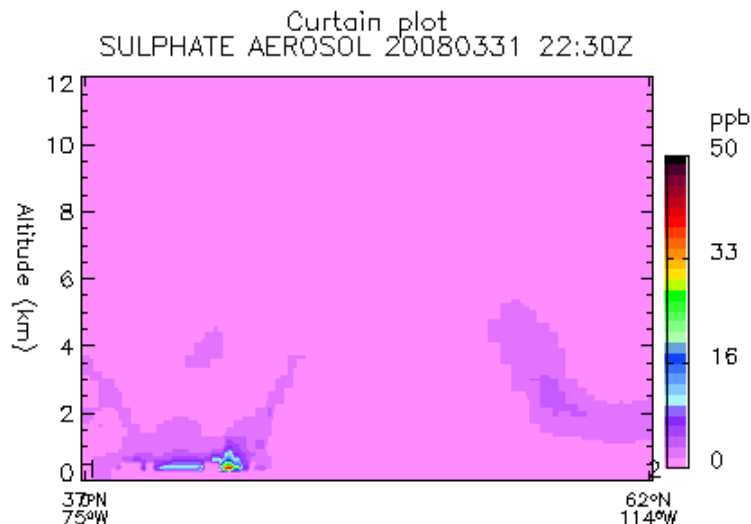


3-31-2008: Wallops to Yellowknife

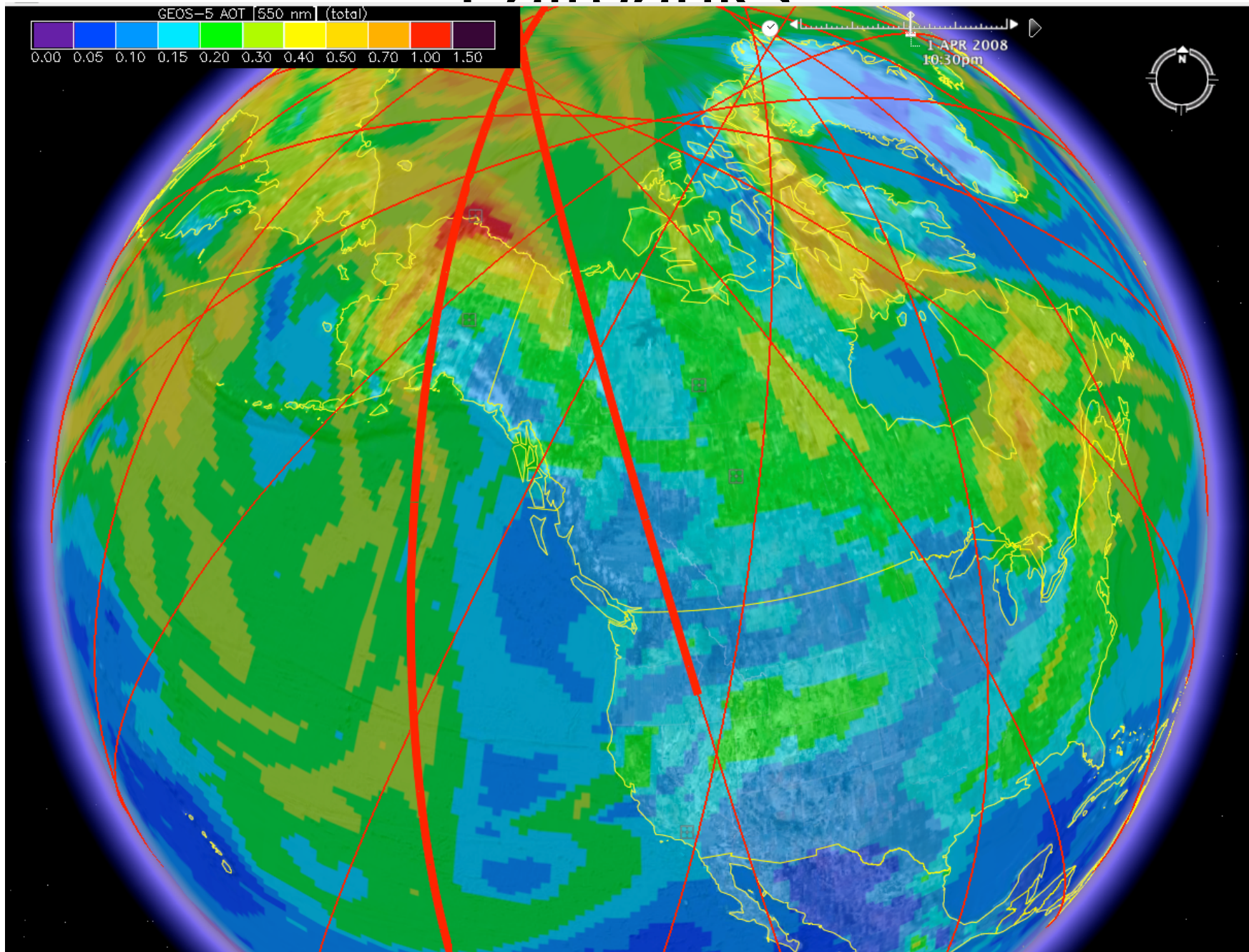
3/31 22:30 UTC (18:30 LT Wallops, 15:30

GEOS-5 forecast: 20080330_06z

GEOS-5 forecast: 20080330_06z



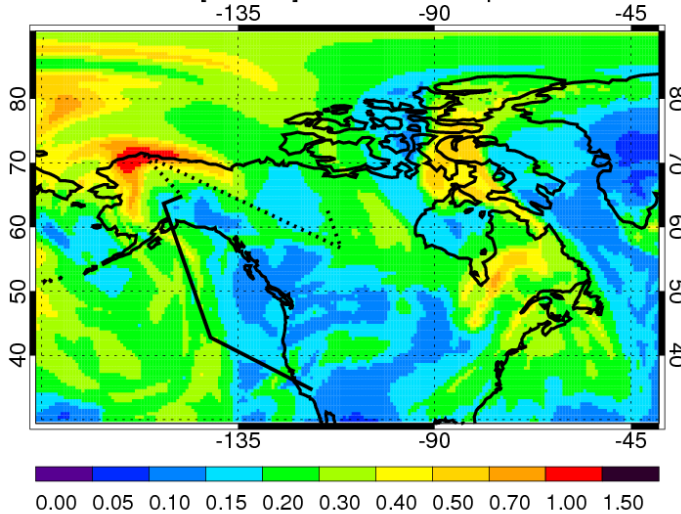
Fairbanks



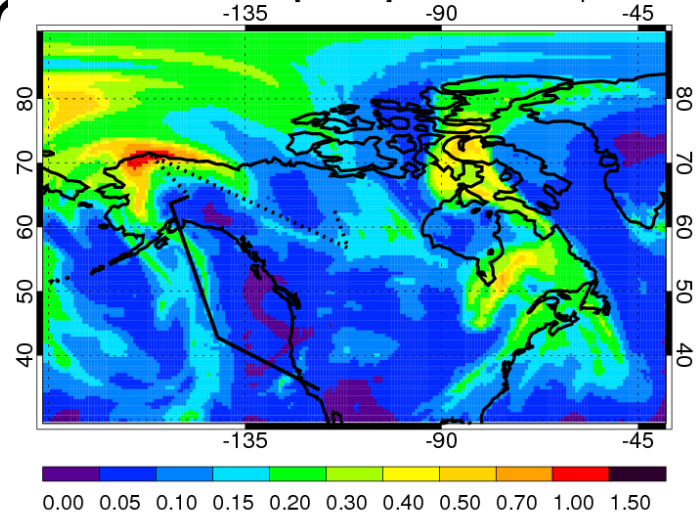
4-1-2008: DC-8 and P-3 to

irbar

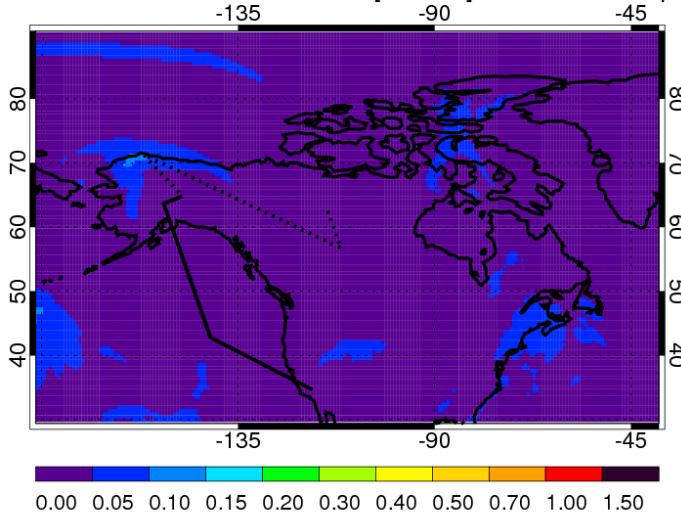
GEOS-5 AOT [550 nm] valid 22:30z01apr2008



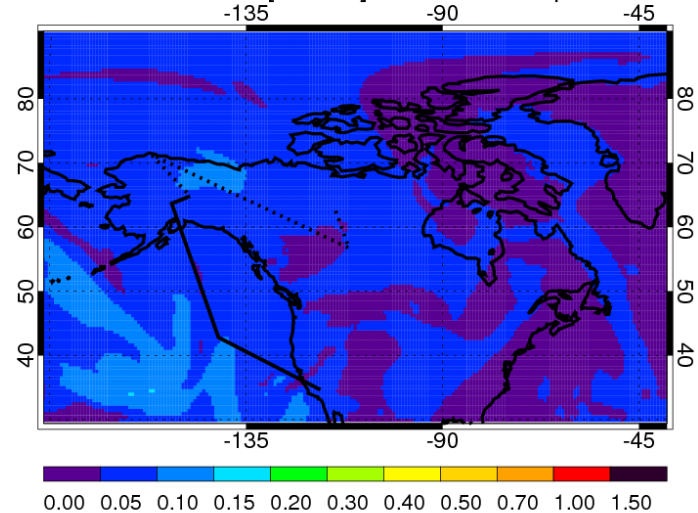
GEOS-5 Sulfate AOT [550 nm] valid 22:30z01apr2008



GEOS-5 Carbonaceous AOT [550 nm] valid 22:30z01apr2



GEOS-5 Dust AOT [550 nm] valid 22:30z01apr2008



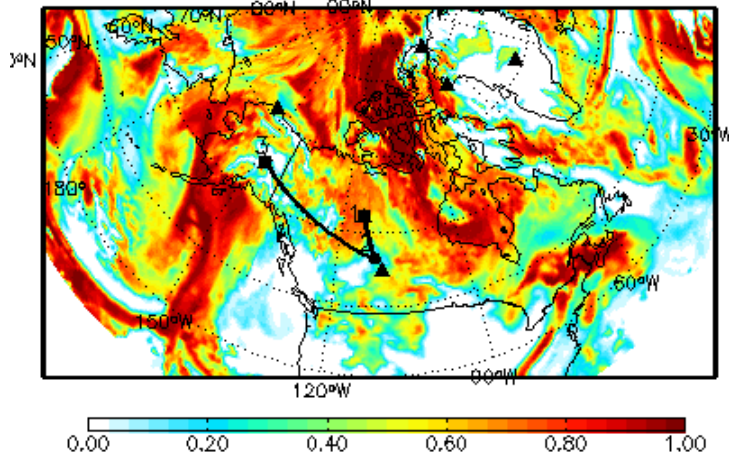
McMurray – Fairbanks

Yellowknife (62.46N, 114.45W) to Fort McMurray

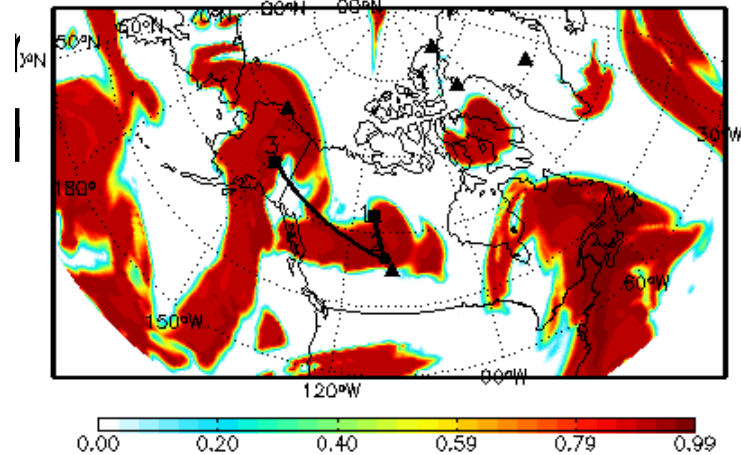
GEOS-5 forecast: 20080330_06z

GEOS-5 forecast: 20080330_06z

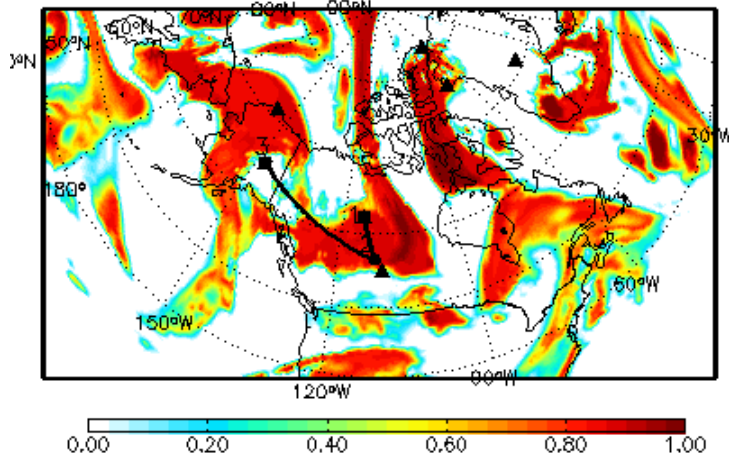
CLOUD_AREA_FRACTION_FOR_LOW_CLOUDS
Surface 20080401 19:30Z



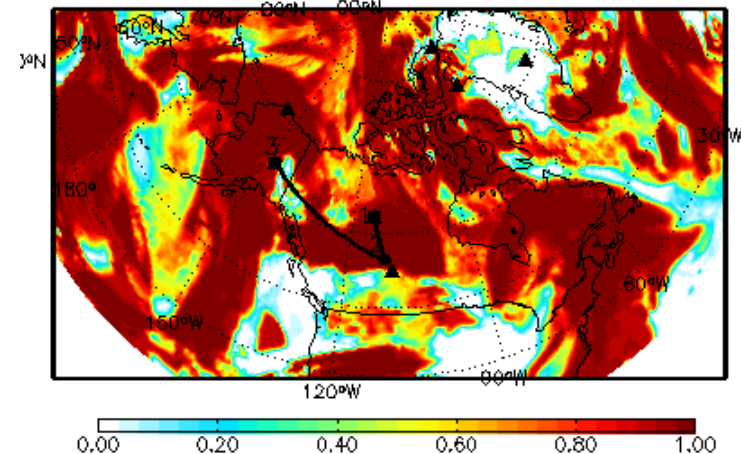
CLOUD_AREA_FRACTION_FOR_HIGH_CLOUDS
Surface 20080401 19:30Z



CLOUD_AREA_FRACTION_FOR_MIDDLE_CLOUDS
Surface 20080401 19:30Z



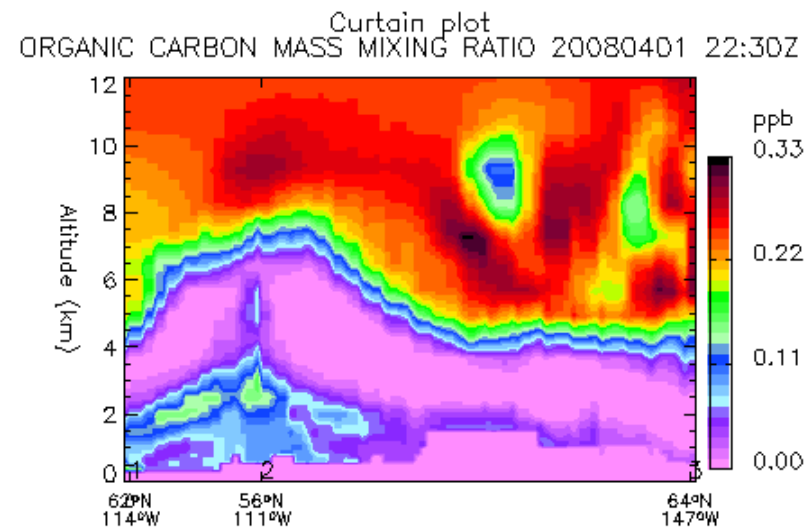
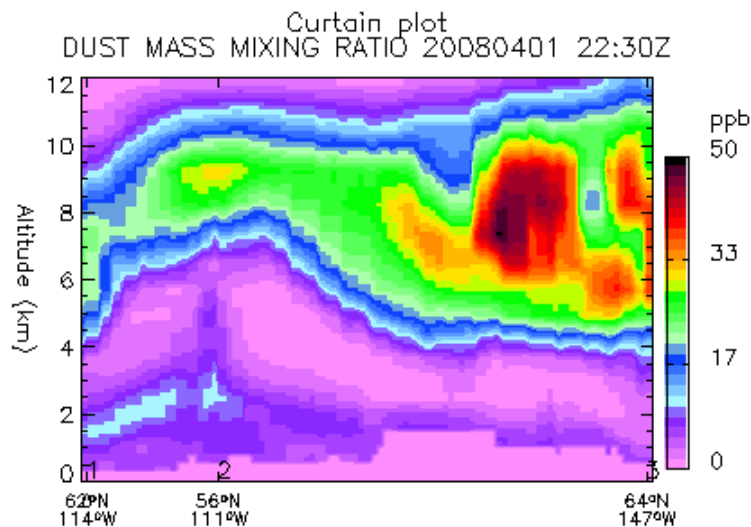
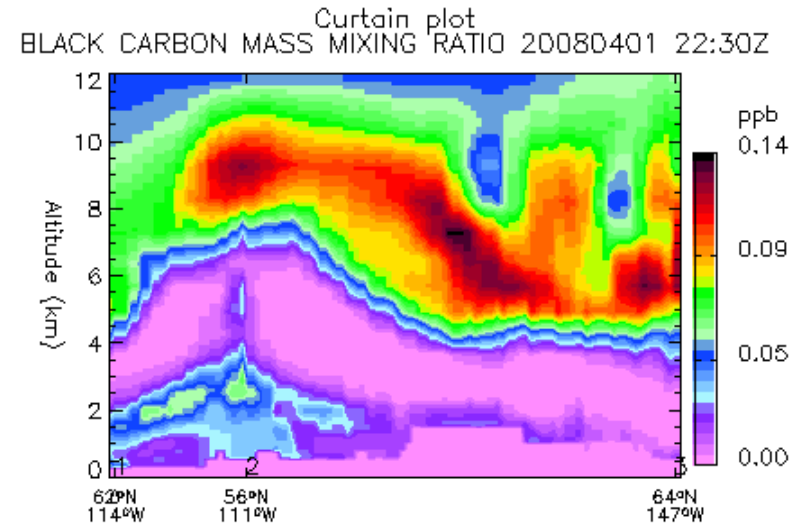
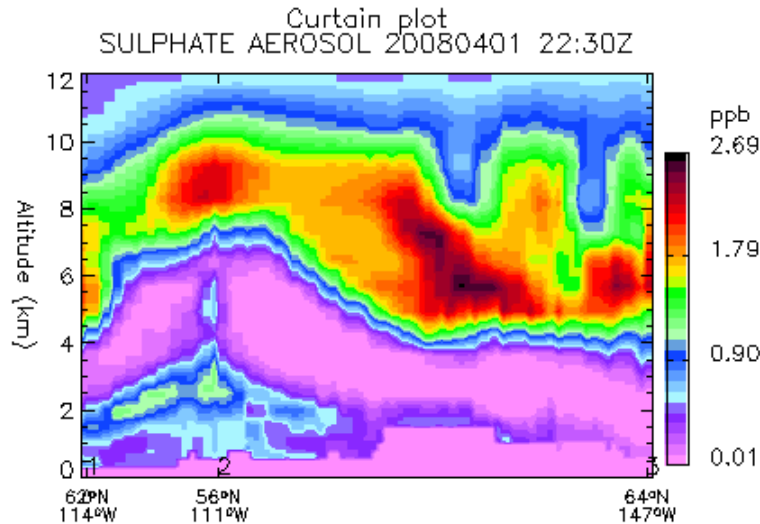
TOTAL_CLOUD_AREA_FRACTION
Surface 20080401 19:30Z



4-1-2008: (a) Yellowknife – Fort McMurray – Fairbanks

GEOS-5 forecast: 20080330_06z

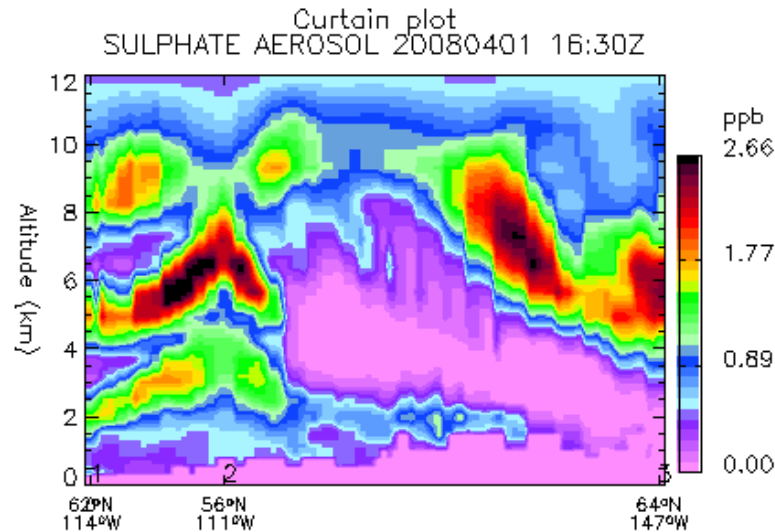
GEOS-5 forecast: 20080330_06z



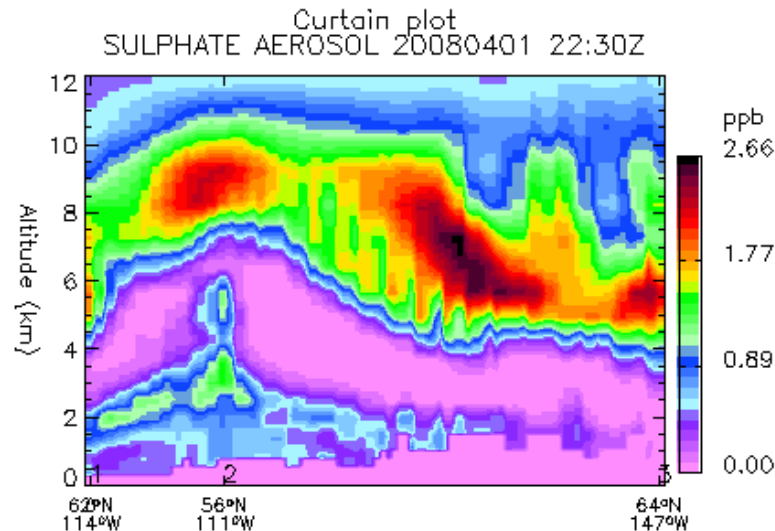
4-1-2008: (a) Yellowknife – Fort McMurray, Fairbanks

GEOS-5 forecast: 20080330_06z

1630Z



2230Z



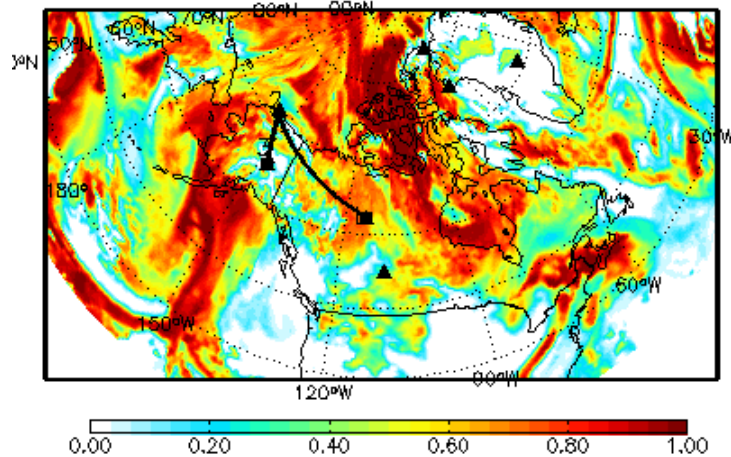
– Fairbanks

Yellowknife (62.28N, 111.27W) to Barrow

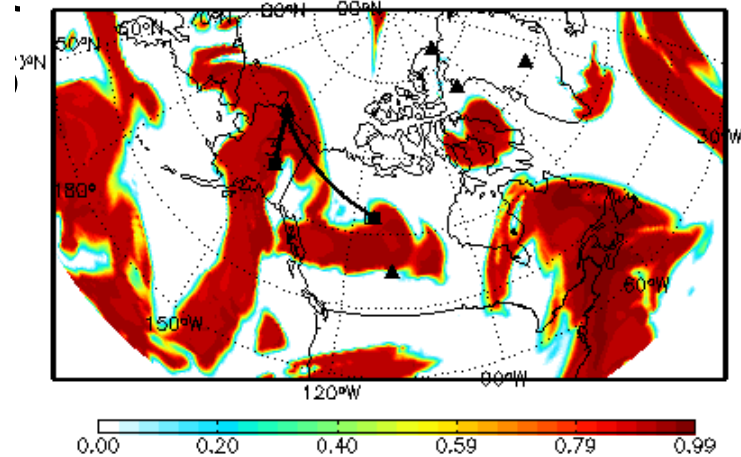
GEOS-5 forecast: 20080330_06z

GEOS-5 forecast: 20080330_06z

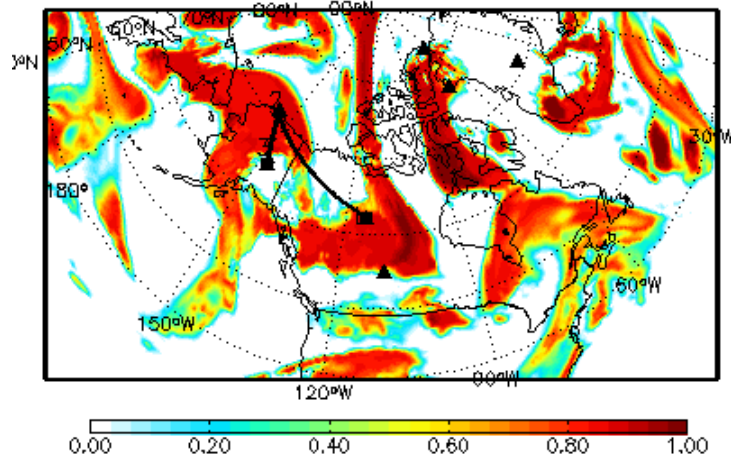
CLOUD_AREA_FRACTION_FOR_LOW_CLOUDS
Surface 20080401 19:30Z



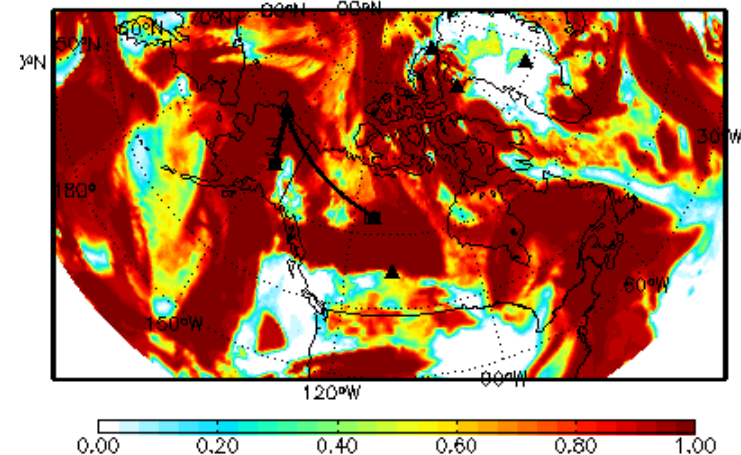
CLOUD_AREA_FRACTION_FOR_HIGH_CLOUDS
Surface 20080401 19:30Z



CLOUD_AREA_FRACTION_FOR_MIDDLE_CLOUDS
Surface 20080401 19:30Z

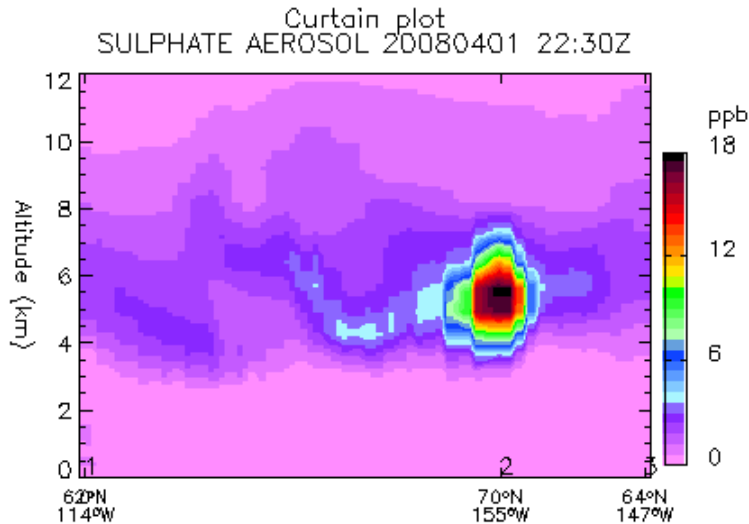


TOTAL_CLOUD_AREA_FRACTION
Surface 20080401 19:30Z

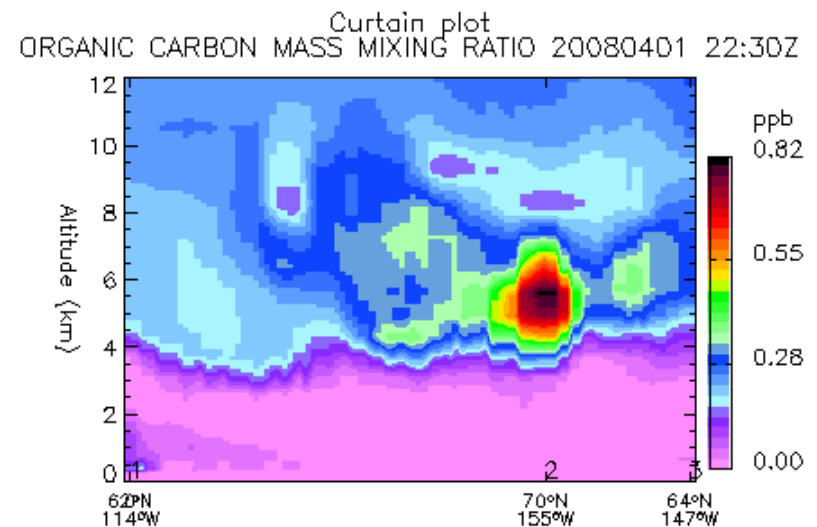
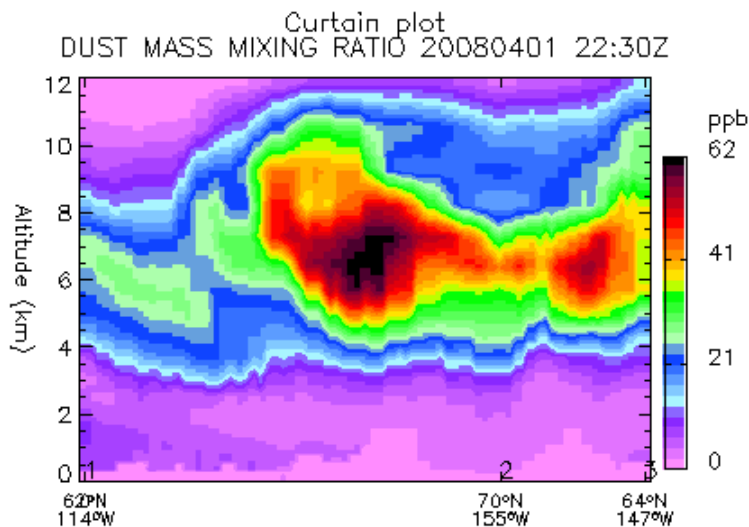
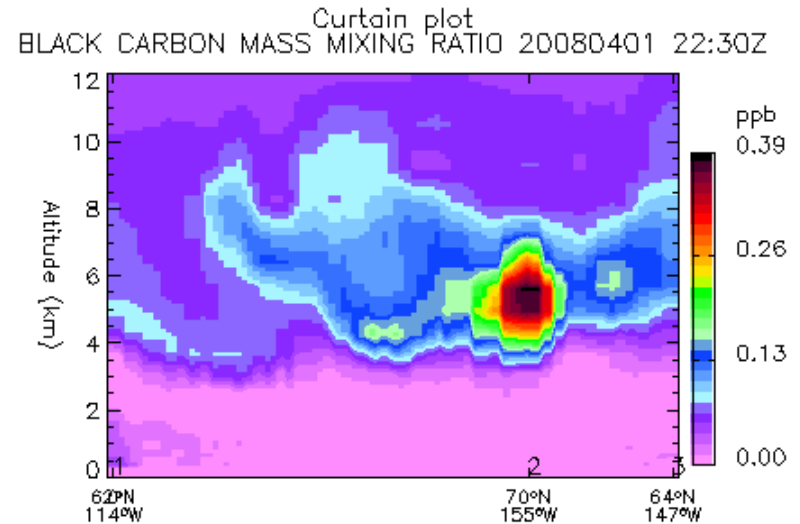


4-1-2008. (b) Yellowknife – Barrow – Fairbanks

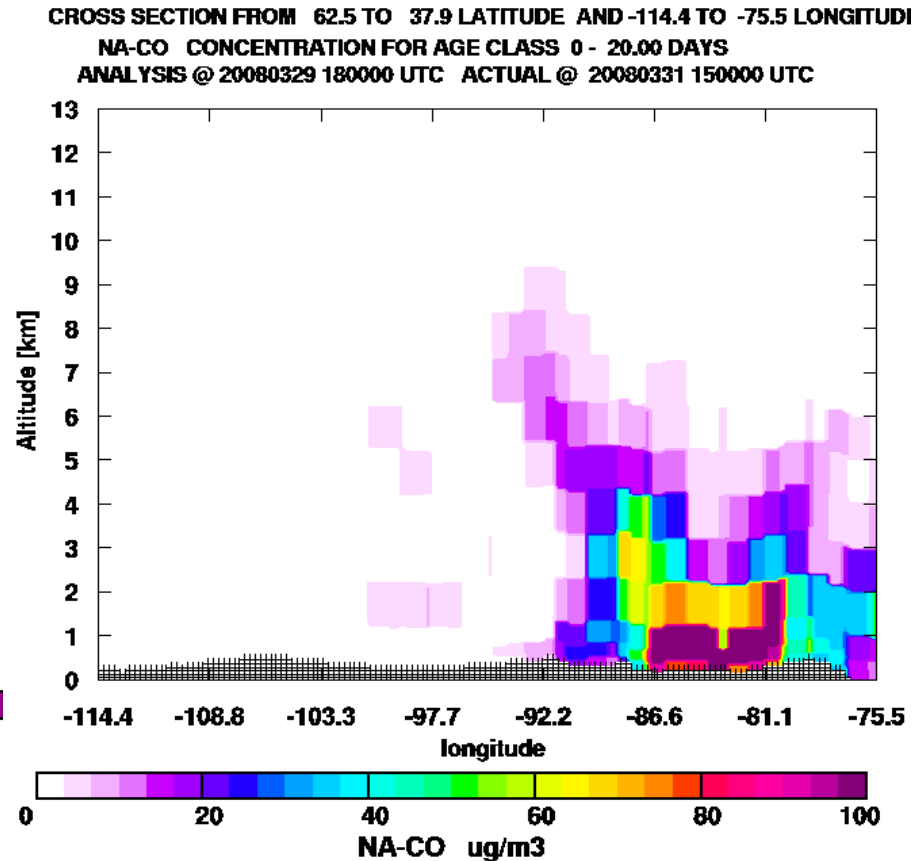
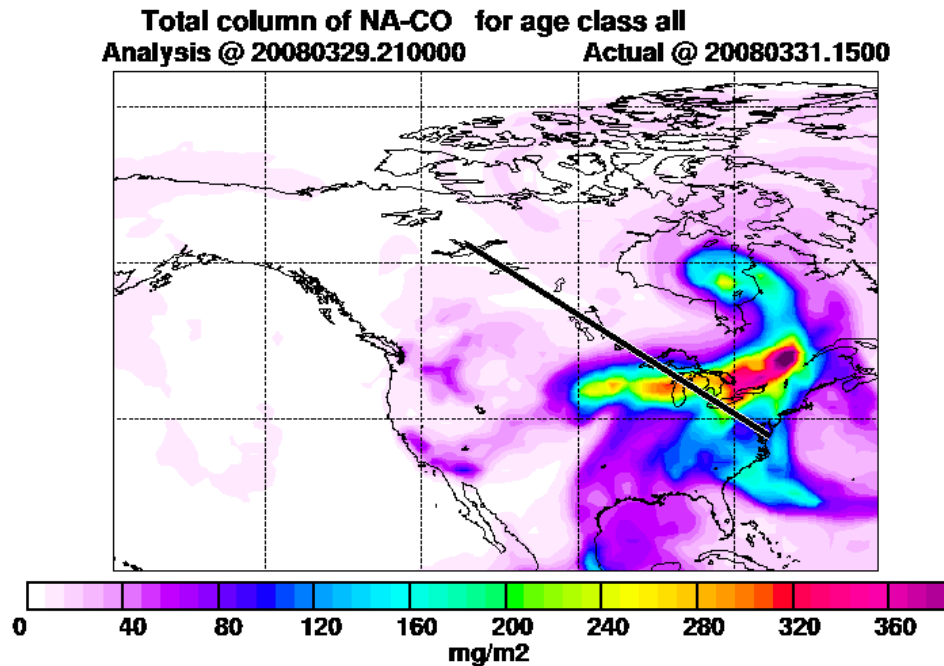
GEOS-5 forecast: 20080330_06z



GEOS-5 forecast: 20080330_06z



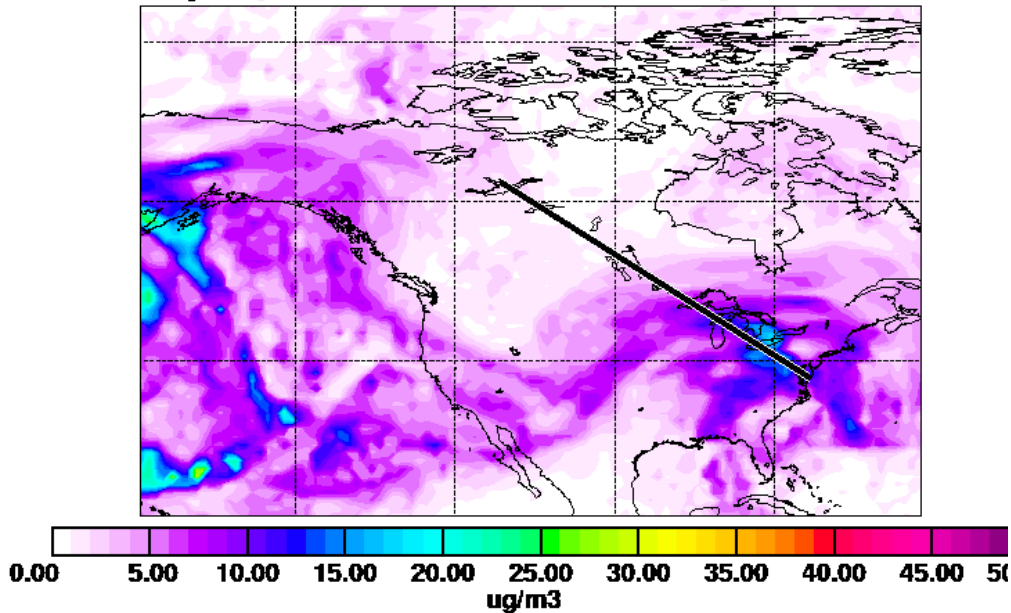
FLEXPART FC, 15-21 UTC 31 Mar, N. American plume



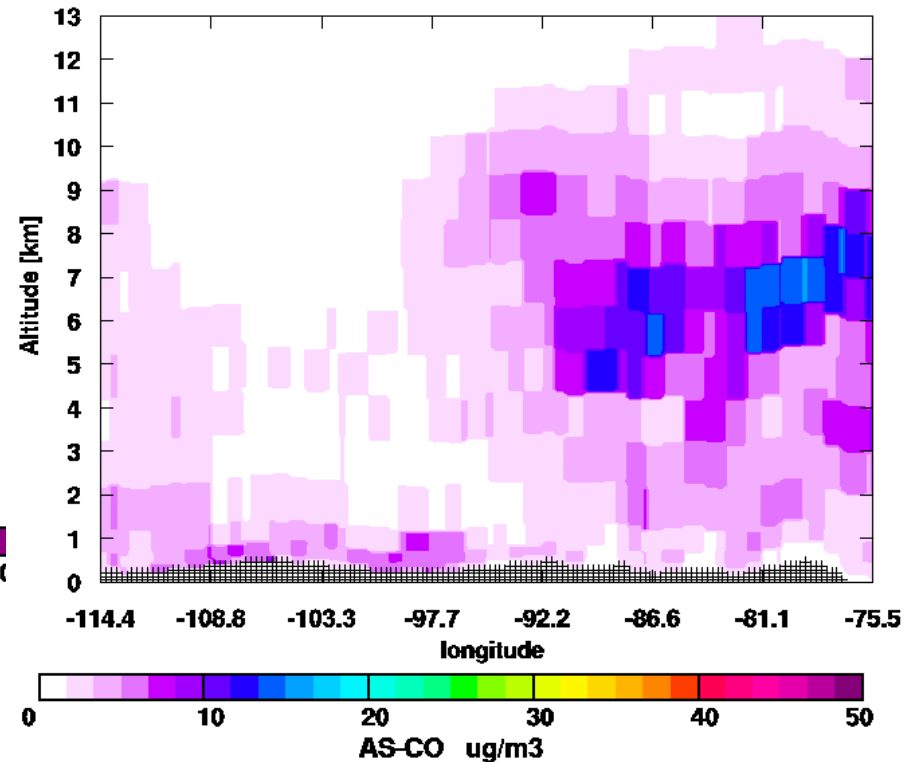
mostly below 3km alt, some up to 4-5km. Plume max south of Lake Superior. Possibly some BC at lowest levels.

FLEXPART FC, 15-21 UTC 31 Mar, Asian plume

Mixing ratio of AS-CO at 7000 m asl for age class all
Analysis @ 20080329.210000 Actual @ 20080331.1500



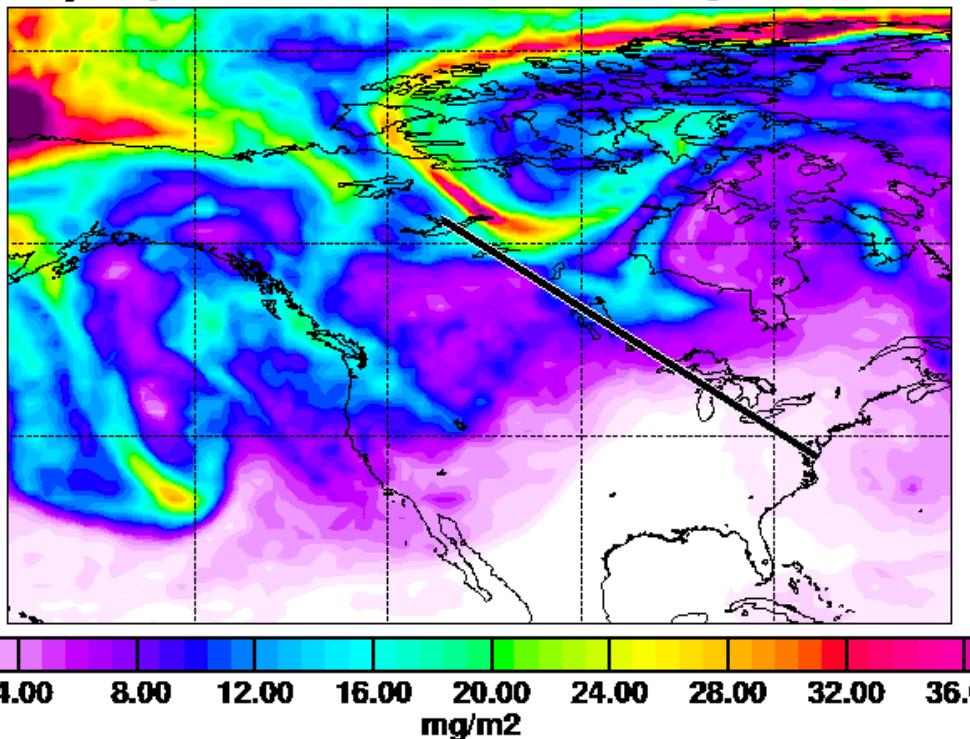
CROSS SECTION FROM 62.5 TO 37.9 LATITUDE AND -114.4 TO -75.5 LONGITUDE
AS-CO CONCENTRATION FOR AGE CLASS 0 - 20.00 DAYS
ANALYSIS @ 20080329 180000 UTC ACTUAL @ 20080331 150000 UTC



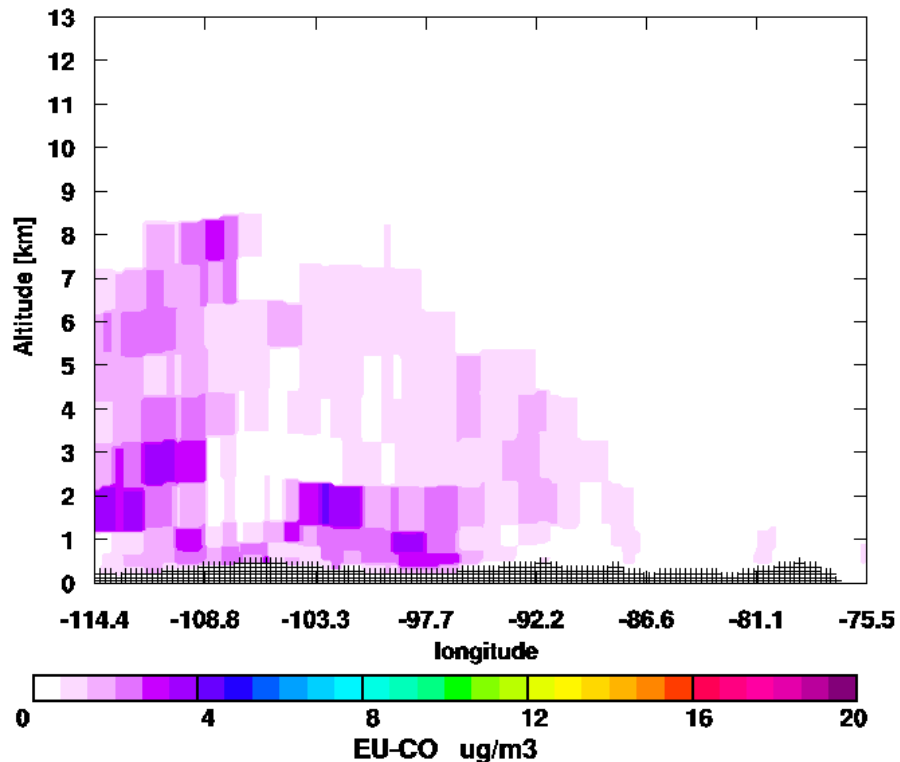
max at 7km alt along jet stream, south of 50N. Vertical extent 4-8km alt.

FLEXPART FC, 15-21 UTC 31 Mar, EU plume

Total column of EU-CO for age class all
Analysis @ 20080329.210000 Actual @ 20080331.1500



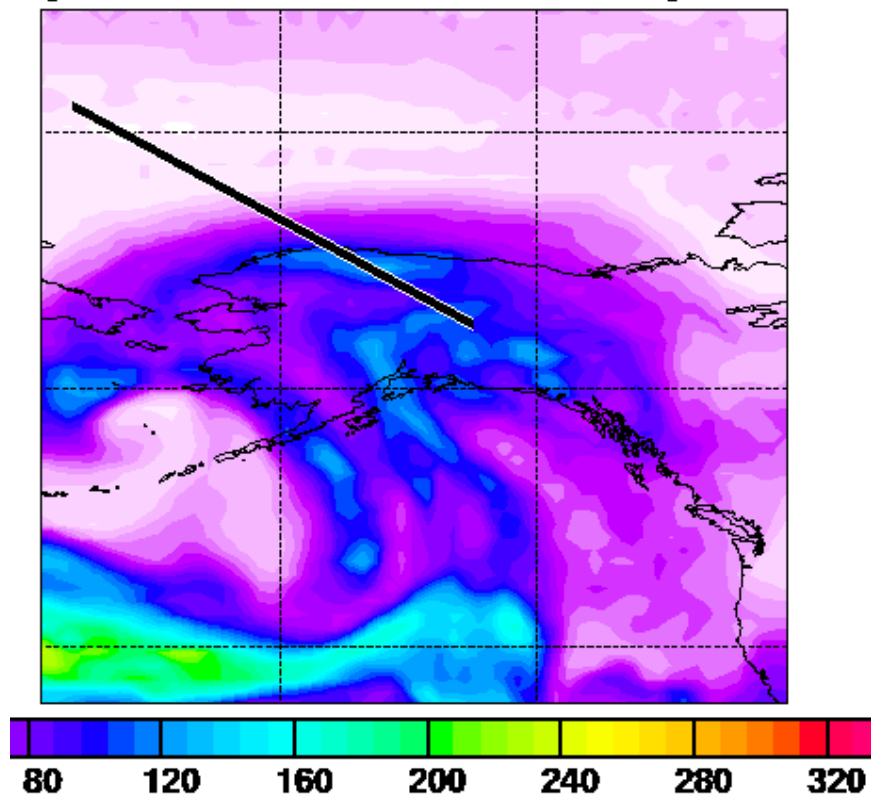
CROSS SECTION FROM 62.5 TO 37.9 LATITUDE AND -114.4 TO -75.5 LONGITUDE
EU-CO CONCENTRATION FOR AGE CLASS 0 - 20.00 DAYS
ANALYSIS @ 20080329 180000 UTC ACTUAL @ 20080331 150000 UTC



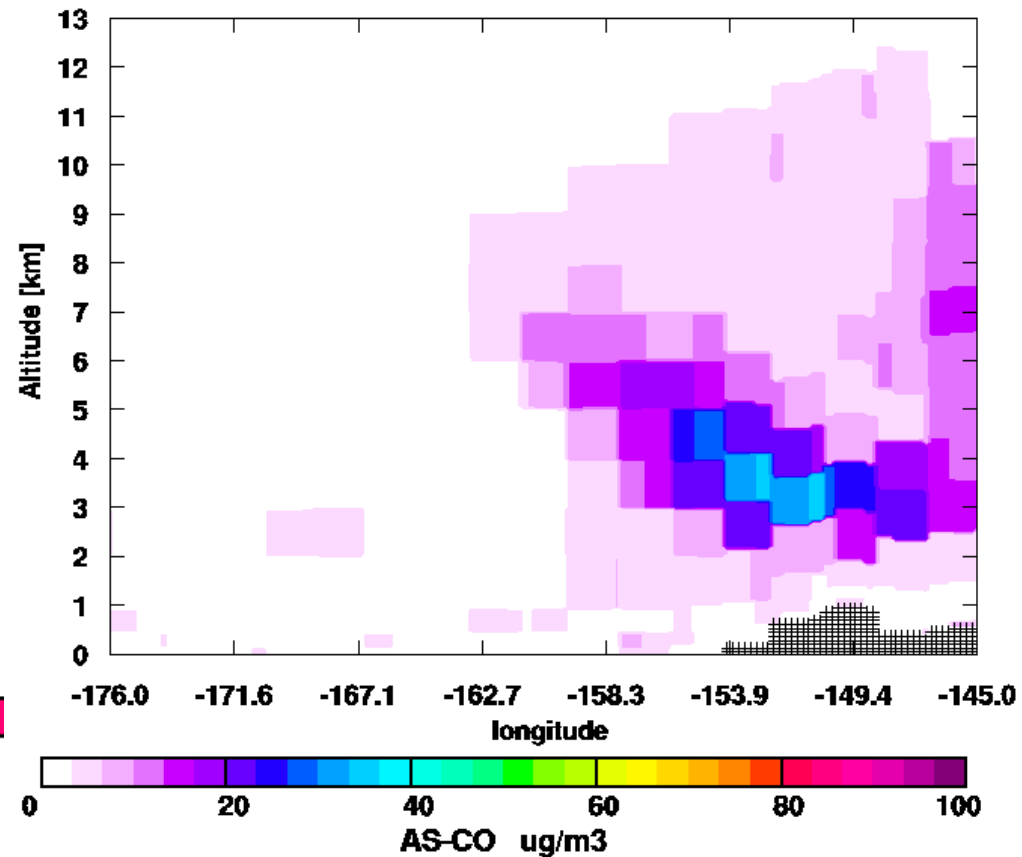
possible encounter with plume north of 50N, further towards the east, mostly around 2-3km alt.

FLEXPART FC, 15-21 UTC 1 Apr, AS plume

1 column of AS-CO for age class all
s @ 20080330. 90000 Actual @ 20080401.



CROSS SECTION FROM 82.0 TO 65.0 LATITUDE AND -176.0 TO -145.0 LONGITUDE
AS-CO CONCENTRATION FOR AGE CLASS 0 - 20.00 DAYS
ANALYSIS @ 20080330 60000 UTC ACTUAL @ 20080401 150000 UTC

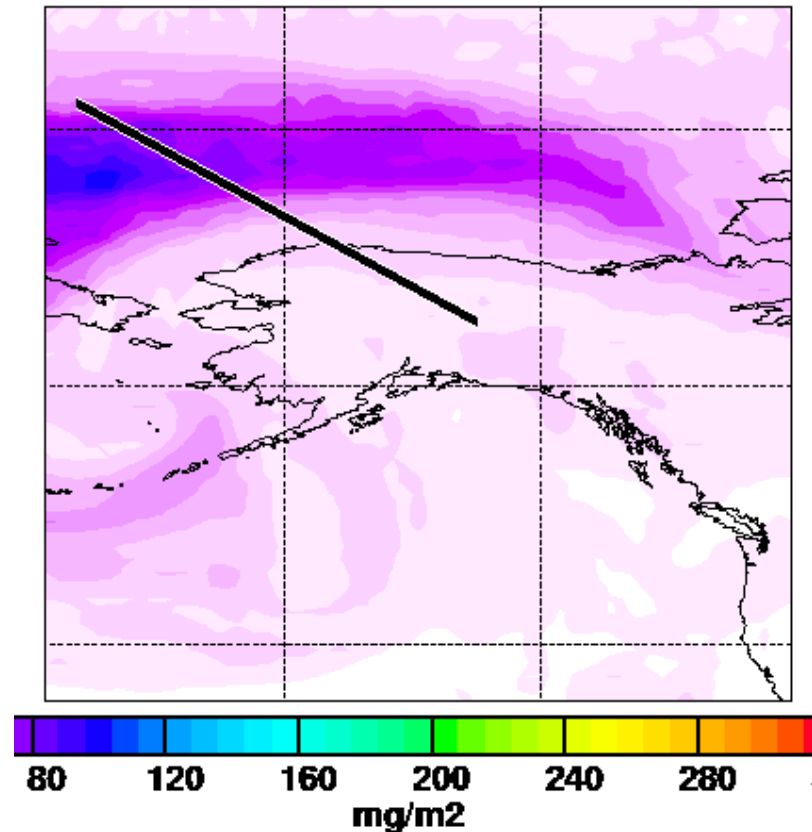


FLEXPART FC, 15-21 UTC 1 Apr, EU plume

1 column of EU-CO for age class all

3 @ 20080330. 90000

Actual @ 20080401



CROSS SECTION FROM 82.0 TO 65.0 LATITUDE AND -176.0 TO -145.0 LONGITUDE

EU-CO CONCENTRATION FOR AGE CLASS 0 - 20.00 DAYS

ANALYSIS @ 20080330 60000 UTC ACTUAL @ 20080401 150000 UTC

